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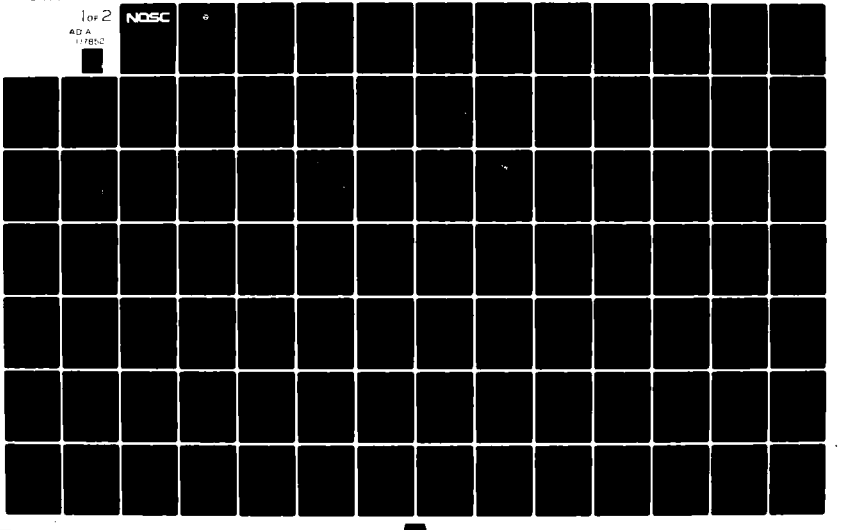

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EMI EVALUATION OF SESEF

ST Li
JC Logan
DWS Tam

February 1982

Prepared for
Naval Sea Systems Command

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NAVAL OCEAN SYSTEMS CENTER
SAN DIEGO, CALIFORNIA 92152

NAVAL OCEAN SYSTEMS CENTER, SAN DIEGO, CA 92152

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EM scattering	EM Pattern Range
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20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This report describes an EMI evaluation of the effects of off-shore exploratory drilling operations on the SESEF facility at Long Beach Naval Shipyard. This study uses mathematical model simulation techniques to determine interference effects due to electromagnetic scattering (diffraction and multipath reflections). Interference due to radio frequency transmissions and electromagnetic noise is also considered.

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1.0 INTRODUCTION

1.1 BACKGROUND

The Shipboard Systems Evaluation Facility (SESEF)* located near Long Beach is maintained and operated as part of the operations and mission requirements of the Long Beach Naval Shipyard. SESEF is an electromagnetic measurement and test range used to evaluate the performance of shipboard communications, radar, IFF, and EW electronic systems. SESEF directly supports the operating Fleet by performing real time analysis of electromagnetic radiation from shipboard electronic systems to (1) identify and resolve antenna system problems, (2) validate antenna system engineering designs and installations, (3) verify repairs and alterations, and (4) assess the impact of alignment errors in beam forming antennas.

The principal SESEF range consists of a receive site located at Seal Beach (lat 33° 44'N, long 118° 05'W), a transmit site located approximately 13.89 km (7.5 nmi) due south (marked by a buoy at lat 33° 36' 20"N, long 118° 05' 22"W) (fig 1-1). The usual procedure is to measure the signal at the receive transmit site while radiating from a selected antenna. Bearing signals from the ship's gyro system are simultaneously broadcast back to the receive site to synchronize the recorded data to the ship's heading. Relative field intensities are recorded for cw and pulsed transmission modes to obtain antenna coverage patterns and superstructure integrity (or blockage) patterns. Calibration curves for direction finding equipments are obtained in a similar fashion.

Other measurements are performed in a range extending to the southwest from the receive site (fig 1-1). Occasionally, transmissions directly from ships moored at the Long Beach Naval Shipyard are authorized and monitored at the SESEF receive site.

The Department of Interior has recently announced plans to open up additional off-shore areas to industry for oil and gas exploration. Some of

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*Also known as the Combat System Evaluation Range (CSER).

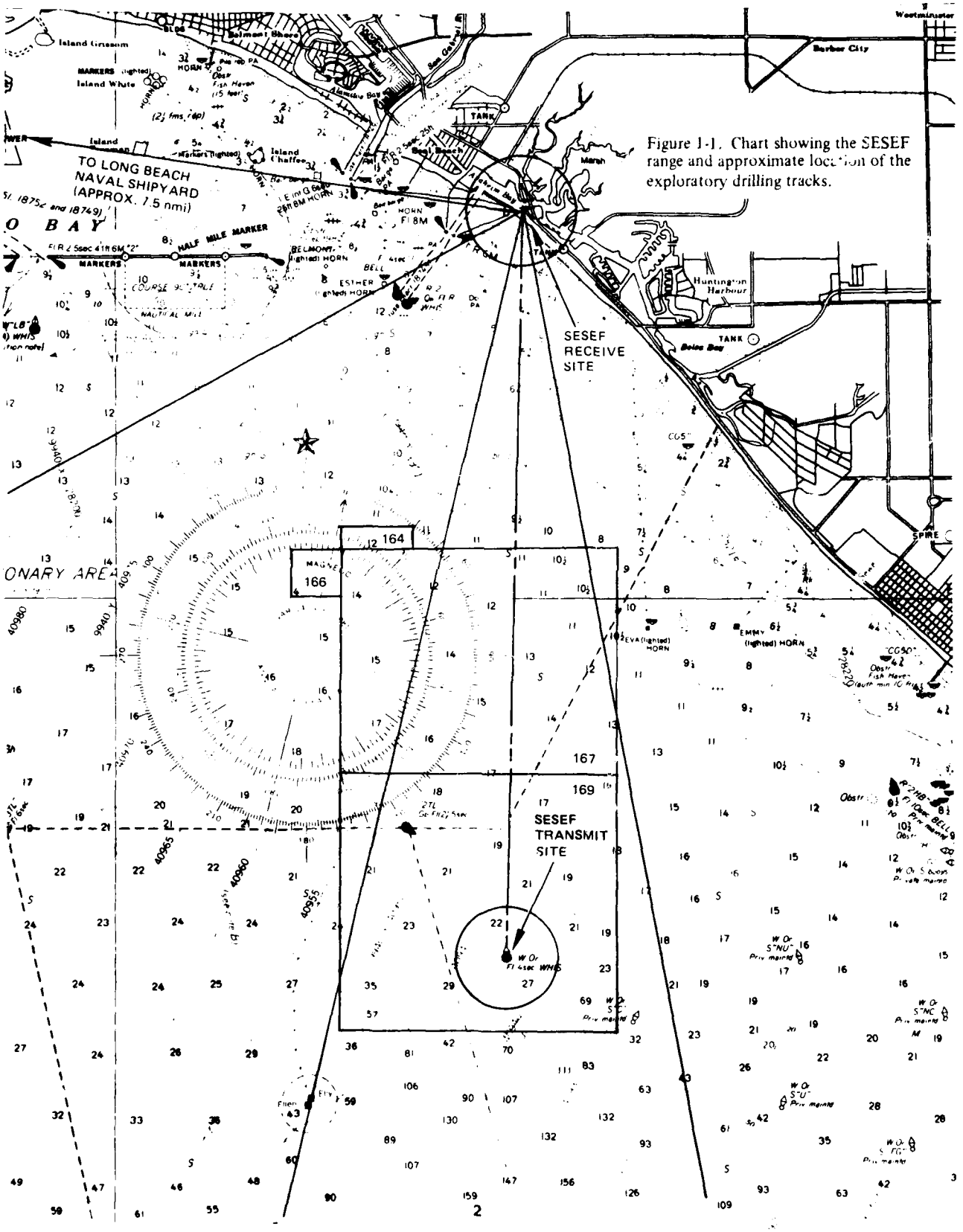

Figure 1-1. Chart showing the SESEF range and approximate location of the exploratory drilling tracks.

the tracts proposed for release (tract numbers 164, 166, 167 and 169) encroach upon the operational area of the principal SESEF range. Drilling and pumping activities in these tracts could potentially interfere with or disrupt the normal SESEF activities to the detriment of the operating Fleet.

1.2 OBJECTIVE

The objective of this report is to conduct an electromagnetic interference (EMI) evaluation to determine the effects of interfering objects (passive and active EMI) in the near proximity (viz the propagation field) of the naval ship-to-shore electromagnetic test range facilities (ie, SESEF).

1.3 SCOPE

Herein, we are confined to the use of mathematical model simulation techniques. These techniques will determine the EMI effects on SESEF due to objects with dimensions and composition commensurate with platforms and towers employed in off-shore exploratory drilling operations. The study is also concerned with the possible drill sites within the transmission width (or propagation corridor) of the SESEF range. Primary use SESEF test frequencies are being considered.

The following EMI aspects have been investigated: (1) Antenna pattern distortion (ie, measurement error) due to multipath reflection and diffraction of electromagnetic energy from scattering objects within the SESEF range. (2) Degradation of SESEF reception and transmission due to interference caused by radio transmissions and electromagnetic noise emanations from operating machinery associated with the drilling operations.

Acoustic propagation effects due to drilling operations are not included here. Neither are the safety aspects of SESEF test operations related to increased boat and air traffic associated with drilling operations or the hazards of navigation posed by platforms located within the SESEF range.

1.4 APPROACH

EMI may be classified as passive or active. Active interference may be from natural or man-made sources.

Passive EMI includes interference caused by:

(1) direct blockage of signal paths by intervening objects,

(2) reflection and diffraction of electromagnetic energy from objects producing multipath effects, eg, distortion of measurement patterns, and

(3) resonant or nearly resonant structures (usually located within the transmit antenna near field) which introduce parasitic effects, ie, the introduction of otherwise nonexistent pattern distortion.

Active natural sources of EMI include terrestrial noise, atmospheric storms and precipitation static, and extraterrestrial noise from the sun and stars.

Man-made EMI sources can be classified as (1) coherent interference such as the normal emissions and harmonic outputs of radio transmitters and the sidebands associated with various modulation techniques, and (2) incoherent random interference occurring as a nonessential and often unwanted emission during the normal operation of electronic and electrical equipments.

Developing a reliable and accurate data base is generally the most difficult part of an EMI evaluation. For example, in the case of passive EMI the problem is to adequately describe the myriad of drilling platform and tower configurations into a finite set of models. In the case of active EMI, the out of band performance of the victim receiver is generally unknown. And in this case, little is known about the spectrum and levels of emissions from drilling platforms and related activities. Direct measurement of required parameters is time consuming and too expensive. If data are not available, a reasonable engineering estimate must be used or the analysis cannot be performed.

The approach for passive EMI is to utilize a set of computer codes that have been developed for modeling of antennas and other conducting surfaces in complex geometries. A brief description of these codes is given in Section 2.1 The SESEF range is modeled as a perfectly conducting flat ground plane. At hf a quarterwave monopole is used as the source at the transmit site. For frequencies at vhf, uhf, and above, a half-wave dipole elevated at a nominal height of 25 metres is used. Scattering models for various sizes and shapes of drilling platforms are introduced into the range. These models are described in Section 2.3. The signal level (in dB) at the receive site is calculated as the models are moved along an arc at a fixed distance from the transmit site. A pattern degradation factor, defined in Section 2.2, is used to evaluate the data thus obtained. The data are tabulated for future reference in Appendices A through D. A summary of the results from evaluation of the data is given in Section 2.3 and these results are used as a basis for the conclusions and recommendations in Section 4.0.

The approach for active EMI is to establish the maximum tolerable interference signal levels at the receive site due to incoherent electromagnetic emissions from the drilling operations. This approach is used since the location of the platforms as well as the nature of the electromagnetic emissions due to drilling operations are presently unknown. An acceptable level is established relative to the ambient noise at the receive site or the receiver internal noise, whichever is greater. In the case of coherent EMI, predictions are based on the adjacent signal rejection characteristics of the receiver. Details of the analysis are given in Section 3.0. These results are also reflected in the conclusions and recommendations of Section 4.0.

2.0 PASSIVE INTERFERENCE - EM SCATTERING

2.1 NUMERICAL ANALYSIS TOOLS

Two computer codes are applied to the electromagnetic (EM) scattering problem. These codes are the Numerical Electromagnetics Code (NEC) - Method of Moments[1] and the Numerical Electromagnetics Code (NEC) - Basic Scattering Code[2-3]. The choice of which code to use depends on the frequency range and the electrical size of the scattering surfaces. In the hf range, 3 to 30 MHz, the drilling towers are fractions of a wavelength or just a few wavelengths in extent. In this case, the Method of Moments Code is used to solve the boundary value problem for the currents on the antenna and surrounding counductors. At vhf, 30 to 300 MHz, and uhf, 300 to 3000 MHz and above, the drilling towers are an appreciable number of wavelengths in size and it becomes uneconomical to use the Method of Moments Code. An asymptotic technique such as the geometric theory of diffraction used in the Basic Scattering Code can give accurate predictions at an affordable cost.

The Numerical Electromagnetics Code — Method of Moments — is the most advanced computer code available for the analysis of thin wire antennas. It is a highly user-oriented computer code offering a comprehensive capability for the analysis of the interaction of electromagnetic waves with conducting structures. The program is based on the numerical solution of integral equations for the currents induced on the structure by an exciting field.

NEC combines an integral equation for smooth surfaces with one for wires to provide convenient and accurate modeling of a wide range of applications. The NEC model may include nonradiating networks and transmission lines,

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1. NOSC TD 116, Numerical Electromagnetics Code (NEC) - Methods of Moments, by GJ Burke and AJ Poggio, January 1981

2. Technical Report 784508-18, Numerical Electromagnetics Code (NEC) - Basic Scattering Code, Part I: User's Manual, by RJ Marhefka and WD Burnside, Ohio State University Electroscience Laboratory, September 1979

3. Technical Report 784508-14, Numerical Electromagnetics Code (NEC) - Basic Scattering Code, Part II: Code Manual, by FW Schmidt and RJ Marhefka, Ohio State University Electroscience Laboratory, September 1979

perfect and imperfect conductors, lumped element loading, and ground planes. The ground plane may be perfectly or imperfectly conducting. Excitation may be via an applied voltage source or incident plane wave. The output may include currents and charges, near and far zone electric or magnetic fields, and impedance or admittance. Many other commonly used parameters such as gain and directivity, power budget, and antenna-to-antenna coupling are also available.

The Numerical Electromagnetics Code (NEC) - Basic Scattering Code (BSC)* is the most advanced computer code available for the analysis of electromagnetic scattering using high frequency asymptotic techniques. BSC is based on the uniform theory of diffraction (GTD) accorded to Kouyoumjian.[4] IN GTD the electromagnetic energy travels in ray bundles and obeys the laws of reflection usually attributed to light. The surfaces of scattering objects are assumed to be large enough in terms of wavelengths so that reflection and diffraction are a local phenomenon, ie, reflection is independent of the shape of edges from a flat plate and diffraction is independent of the length of the edge. Scattering objects must also be in the far field of the antennas. Special diffraction coefficients can be developed for special edge and surface conditions. The total field can be obtained from a vector summation of all the direct rays, reflected rays, and diffracted rays.

BSC is a highly user-oriented computer code which allows the user to specify the source and scattering objects in any arbitrary configuration. The code performs the ray tracing and computation of the reflected and diffracted fields to determine the total resultant fields and patterns. BSC automatically keeps track of the interactions between scattering objects, ie, the reflected-diffracted fields, the reflected-reflected fields, etc. The user can build a scattering object from any number of arbitrarily shaped flat plates (connected or intersecting or not) and any number of elliptical or

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*BSC will be used in this report to avoid confusion with the NEC - Method of Moments Code.

4. Kouyoumjian, RG and Pathak, PH, A Uniform Geometric Theory of Diffraction for an Edge in a Perfectly-Conducting Surface, IEEE Proc, vol 62, p 1448-1461, November 1974

circular cylinders. Free space or a perfectly conducting ground plane are also options. The source may be an electric or magnetic current element, a slot or rectangular aperture, or a user supplied antenna current distribution. Outputs are electric fields and radiation patterns.

2.2 PATTERN DEGRADATION CRITERIA

The object of the scattering analysis is to determine the effects on the measurements performed at the SESEF receive site due to scattering objects located in the radiation fields of shipboard transmitters at the SESEF transmit site. A strong interaction between the shipboard radiators and the drilling platforms/towers or reflected and diffracted fields from the platforms/towers, producing multipath effects or direct line-of-sight blockage, can all contribute to range errors. The procedure as outlined above is to first model the SESEF range with no scattering objects to obtain the signal level at the receive site. Then the scattering object, a model of a drilling platform/tower, is introduced at some specified distance from the transmit site. The signal at the receive site is calculated and compared to that determined for the no-scattering object case. The change in the signal level gives an indication of the scattering effects due to the drilling tower. A pattern degradation factor is defined as this difference or change in signal level and is expressed in dB.

The pattern degradation factor is tabulated in Appendices A through D for a number of scattering geometries at primary SESEF frequencies. A positive value indicates an increase in signal level and a negative value a decrease in signal level due to the introduction of a scattering object into the radiation field of the transmit antenna. The direction of the change is not too important; only the magnitude of the change has significance. The magnitude of the pattern degradation factor is a measure of the pattern distortion due to scattering from the drilling towers. In evaluation of the results, the problem is to select a suitable pattern degradation threshold level to distinguish between acceptable and unacceptable pattern distortion.

The instrumentation used for most work at the SESEF receive site makes use of the Singer EMI/Field Intensity Meters (models NM-17/27, NM-37/57, and NM-67). These receivers have rated voltage measurement accuracies of $\pm$ 2 dB for cw signals and $\pm$ 3 dB for impulse signals.[5-7] These are worst-case limits for absolute signal level measurements. Typically, patterns indicating the relative signal variations measured using these meters should be able to resolve changes on the order of 1 dB under reasonably good conditions. Allowing for a reasonable engineering margin, the pattern degradation threshold level for acceptable pattern distortion should be held to less than 0.5 dB (or one half the system resolving power). The pattern distortion due to scattering from drilling platforms/towers should be less than 0.5 dB in terms of the magnitude of the pattern degradation factor.

2.3 SCATTERING MODELS

The models used to represent the drilling towers depend on the frequency range to be modeled and, hence, on the computer program applied to the analysis. The hf models are discussed first, followed by a description of the vhf and uhf models.

The NEC (Method of Moments) Program solves for currents on conducting wires and solid closed surfaces as specified by the user. The wire modeling capability is appropriate for this application. The structure is represented by a collection of wires. The wires must be electrically thin so that the currents will have physical meaning. The wires are divided into segments in sufficient numbers to provide accurate resolution of the current distribution as outlined in TD 116, Part III.[1] There is always a tradeoff between accuracy and the size of the problem, ie, the resulting matrix size to be solved.

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5. Singer Instrumentation Data Bulletin, RFI-104B, EMI Field Intensity Meter Model NM-17/27 (no date available)

6. Singer Instrumentation Data Bulletin, RFI-103B, EMI Field Intensity Meter Model NM37-57 (no date available)

7. Singer Instrumentation Preliminary Data Bulletin RFI-114P, Programmable EMI Field Intensity Meter Model NM-67 (no date available)

A quarterwave monopole is used for the transmit antenna for the entire hf band. This choice promotes comparisons by providing an omnidirectional, vertically polarized antenna pattern independent of the test frequency. The monopole is modeled by 24 segments with a radius of 0.001 metre.

Three models were investigated to determine how best to represent the drilling tower. One model was a single vertical wire. The other two were four-leg tower models as illustrated in figure 2-1. The single wire model cannot be made fat enough to represent the tower and, hence, was found to be unsatisfactory. The horizontal members connecting the tower legs as shown in figure 2-1(a) were found to be unnecessary. This was true because in most of the cases considered the tower was in the transmit antenna far field which is vertically polarized.

The model used for high frequencies consists of a four-leg tower as in figure 2-2. At frequencies between 2 and 10 MHz, 24 segments are used on each leg. Sixty-eight segments per leg are used for frequencies between 10 and 30 MHz. In all cases, the radius of the tower legs is set at 0.6 metre which is the maximum allowable to maintain the thin wire criteria of NEC. The tallest tower considered is 73.46 metres (241 feet) high with a base 9.15 metres (34.77 feet) square. The above measurements are based on the dimensions of the towers on platform Ellen (see Appendix E). These dimensions are scaled appropriately for other tower heights.

The BSC Program uses collections of platforms and cylinders to represent scattering objects or conducting structures. The structures should be appreciable in size with respect to a wavelength and must be in the source antenna far field (usually a distance of a half wavelength is sufficient).

The source model used for vhf, uhf, and higher frequencies is the half wave electric dipole source provided as an option in the BSC.

The source is a half wavelength dipole excited with unity and zero phase. A nominal height of 25 metres above the water surface is used. This value is

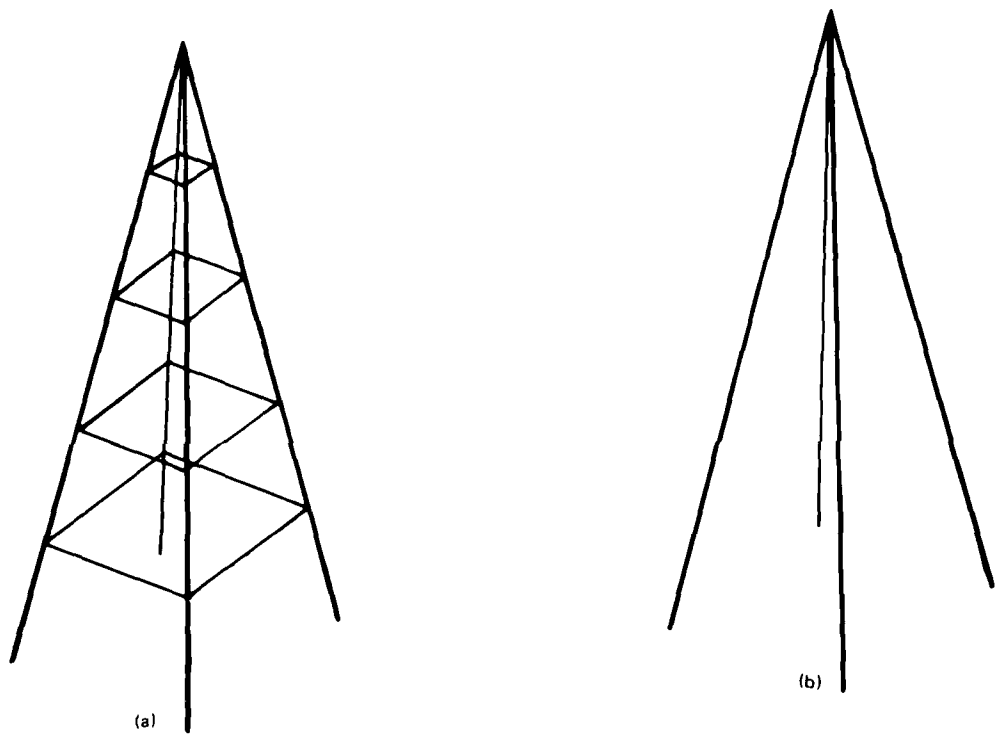

Figure 2-1. Sketch showing the four leg tower (a) with horizontal members; (b) without horizontal members.

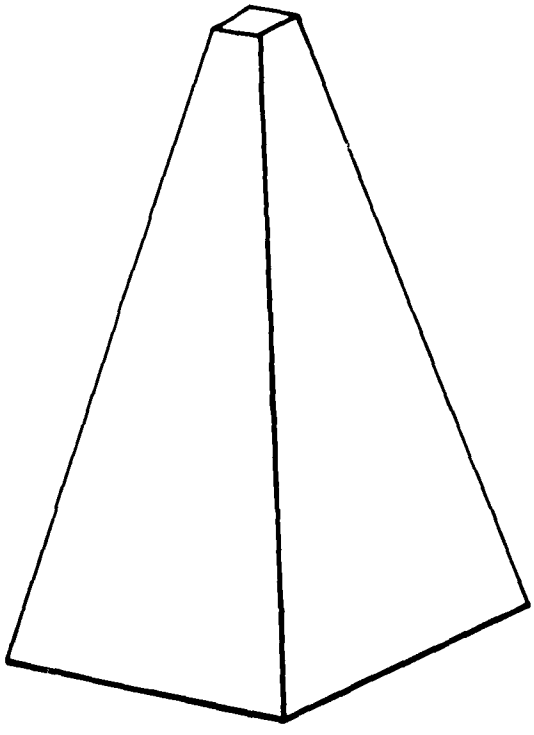

Figure 2-2. Sketch showing the four-sided trapezoidal tower model.

an average height based on the design criteria used for siting vhf and uhf antennas on ships.[8]

A cylindrical model and a trapezoidal model of the drilling tower were considered. The trapezoidal tower was assembled from four flat plates forming a tower as shown in figure 2-2. The cylindrical model is a simple constant radius tower of equal height. The radius is the mean radius of the trapezoidal tower. Tower dimensions are scaled appropriately from platform Ellen (Appendix B). For direct line-of-sight, the trapezoidal tower model provides more blockage than the cylindrical model; otherwise, the cylindrical model is the limiting case. The trapezoidal model must be rotated at each location to find the maximum scattering effect whereas the cylindrical model presents the same scattering effect irrespective of the angle of incidence. Hence, the cylindrical model was used for the scattering analysis.

2.4 ANALYSIS OF THE SCATTERING DATA

The scattering analysis was performed at frequencies selected from the SESEF frequency assignment list (Appendix F). Due to the long run times using the NEC Computer Program, the analysis was performed at only a few high frequencies. Due to the shorter run times associated with the BSC Computer Program, analysis was performed at all of the primary frequencies for vhf and uhf. Midband frequencies were used for analysis of effects at frequencies used for noncommunication systems tests.

Appendix C contains the results for high frequencies. Tabulated by frequency are the pattern degradation values (Section 2.2 for a definition of pattern degradation) resulting from moving the tower model along a circle at distances of 0.1, 0.4, 0.7, 1.0, 2.0, 4.0, 8.0, and 12.0 kilometres. The angle given is the tower position along the circle measured from the north-south line extending between the SESEF receive and transmit sites.

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8. NOSC TD 356, Shipboard Antenna and Topside Arrangement Guidance, by DW Dubrul and LM Peters, September 1974

As one would expect, the data show that at hf the greatest effects occur when the spacing between the tower and the transmit antenna is relatively small. The structure must be closely coupled to the antenna to produce significant pattern degradation. This does not occur for reasonable tower-to-buoy (transmit site) spacings. The effects are also more pronounced at the higher frequencies and for line-of-sight configurations. At the upper end of the hf band, the scattering effects due to multipath propagation modes begin to influence data.

Data for vhf and uhf communication system test frequencies are tabulated in Appendices B and C, respectively. Appendix D contains the data for frequencies between 0.212 and 13.35 GHz. These data show pronounced multipath effects due to scattering from the tower. The worst case occurs (1) at direct line-of-sight, (2) at small angular displacements from direct line-of-sight, and (3) at small tower spacings (less than 1.0 kilometre) on all sides of the transmit site.

The pattern distortion due to scattering can be translated into acceptable and unacceptable locations for drilling operations as follows. In Section 2.2, a pattern degradation threshold level of 0.5 dB is defined to distinguish between acceptable and unacceptable pattern distortion. All tower locations where the magnitude of the pattern degradation factor is 0.5 dB or greater are unacceptable. Sifting through the data, all such tower locations can be identified and noted on a chart.

The result of this operation is shown in figure 2-3. Only points to the left of the SESEF range centerline are plotted. Due to symmetry, the right side is identical. Because of the tedious nature of this operation, only sufficient points are plotted to define the shape of the forbidden region. No towers can be tolerated within 0.8 nautical mile of the transmit site and within a corridor extending 0.5 nautical mile on each side of the centerline running between the SESEF transmit and receive site. The restricted region of 0.8 nautical mile around the transmit site should also be applied to the receive site. Note that this restriction could be reduced to 0.6 nautical

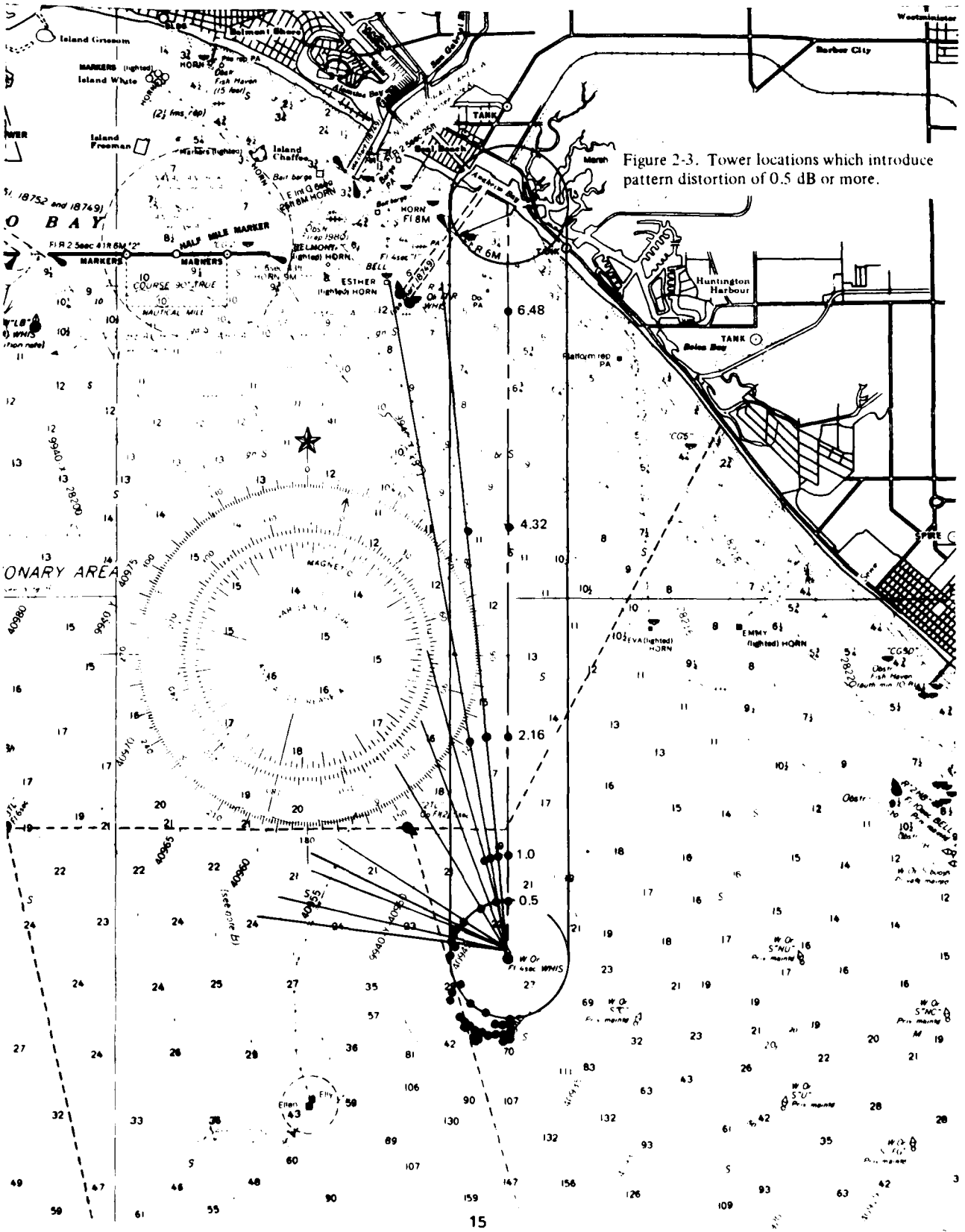

Figure 2-3. Tower locations which introduce pattern distortion of 0.5 dB or more.

mile for tower sites to the east and west of the transmit site and receive site; however, it may be clearer to define the region by a circle than by an ellipse.

The above analysis was also carried out for a cluster of towers. The cluster consisted of from two to four equally spaced towers arranged on a 100 metre radius circle. Similar to the single tower arrangement, the center of the cluster was moved along a circle centered at the receive site to obtain the pattern degradation factor. The results are incorporated into figure 2-3. They show that there is little change in the forbidden zones.

3.0 ACTIVE INTERFERENCE

3.1 TOLERABLE INTERFERENCE LEVEL AT THE RECEIVER LOCATION

This section establishes the maximum tolerable interference level at the receiver site due to incoherent electromagnetic emissions from the drilling operations. For an acceptable level, the interference due to drilling operations should not exceed the ambient noise at the receiver site or the receiver internal noise - whichever is greater. Therefore, the operation of the SESEF range will remain noise-limited - either the current ambient noise or the receiver internal noise.

The ambient noise model used to establish the acceptable interference level is based on measurements compiled by Spaulding and Disney[9] and used by Churchill[10] and by the International Radio Consultative Committee.[11] Figure 3-1 displays curves for the estimated mean value of Fa in business areas, residential areas, rural areas, and quiet rural areas. Fa is defined as the mean noise power in the bandwidth of the receiving system. This is available from a short lossless monopole antenna relative to the available thermal noise power, assuming a perfectly conducting ground plane. Since the SESEF range is located within a business area, the curve for the business area is used as the ambient noise model. An equation to approximate this curve is:

$$Fa = 77 - 27.5 \log f \qquad \text{for } 0.2 \text{ MHz} \leq f \leq 300 \text{ MHz} \qquad (1)$$

where f is in MHz and Fa is in dB relative to thermal noise which is -174 dBm/Hz.

---

9. OT Report 74-38, Man-Made Radio Noise Part I: Estimates for Business, Residential and Rural Areas, by AD Spaulding and RT Disney, US Department of Commerce, Office of Telecommunications, Boulder, CO, June 1974

10. ECAC Final Report ESD-TR-77-004, Naval Shore Electronics Criteria: Man-Made Noise, Second Edition, by RB Churchill, September 1977

11. Report 322, International Radio Consultative Committee (CCIR), World Distribution and Characteristics of Radio Noise, International Telecommunications Union, Geneva, 1964

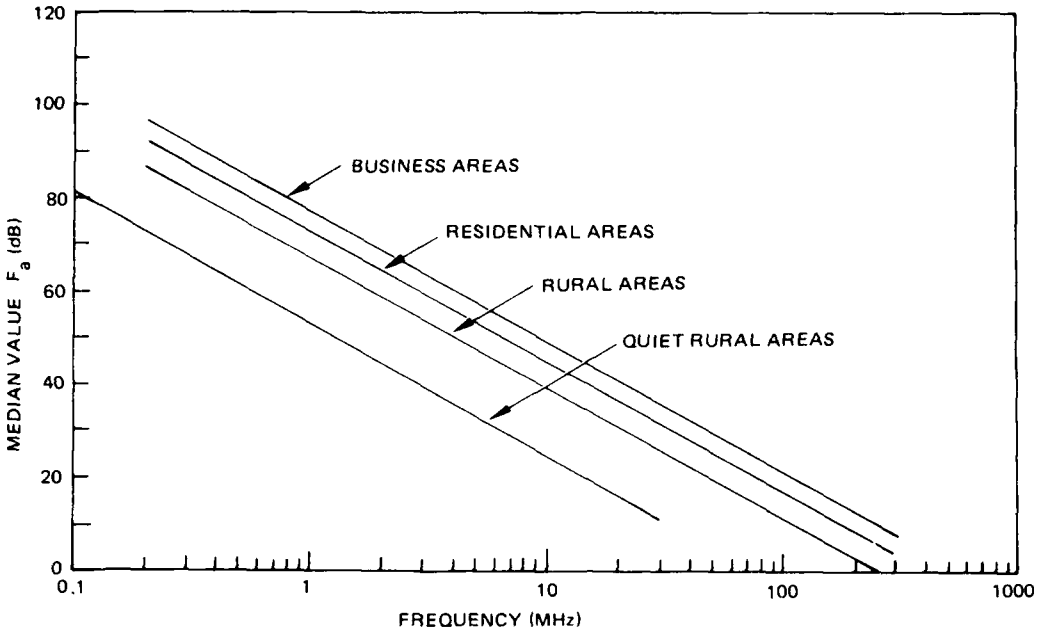

Figure 3-1. Estimates of median Fa values for composite radio noise.

Usually the Fa of a noise source is measured as the noise field intensity. E_B, Fa and E_B can be related by:

$$E_B = Fa + 20 \log f + 10 \log b - 95.5 \quad (2)$$

where

E_B = the rms field intensity of the noise in business areas in dB re 1 μV/m, a function of the bandwidth of the bandwidth of the receiving system.

f = frequency in MHz

b = receiving system bandwidth in Hz.

Substituting equation (1) into (2), and letting b = 1000 Hz, one gets

$$E_B = 11.5 - 7.5 \log f \quad \text{for } 0.2 \text{ MHz} \leq f \leq 300 \text{ MHz} \quad (3)$$

where

E_B is in (dB re 1 μV/m)/kHz.

At the SESEF range, EMI/field intensity meters made by Singer are used as receivers. EMI/field intensity meter model NM-17/27 is used for the frequency range between 10 kHz and 32 MHz; model NM-37/57 for 30 MHz - 1 GHz; and model NM-67 for 1.0 GHz - 18 GHz. Detailed descriptions of the EMI/field intensity meters can be found in the manufacturer's bulletins.[5-7] Receiver noise in dB per receiving bandwidth of each meter is shown in the following table:

Model	Frequency Range	Receiver Internal Noise
NM-17/37	10 kHz - 32 MHz	-26 dB μV/kHz
NM-37/57	30 MHz - 1 GHz	-17 dB μV/10 kHz
NM-67	1 GHz - 18 GHz	7 dB μV/100 kHz

The field intensity (E_R in dB re 1 μV/m) is found by adding an associated antenna factor (K expressed in decibels) to the receiver internal noise (V_R, in dB re 1 μV).

The antenna factor is a function of frequency. An hf loop antenna is used for model NM-17/27 meter and its antenna factor is specified graphically in figure 3-2. Using these curves, one can calculate field intensity E_R at various frequencies as shown below.

f, MHz	0.2	0.375	0.75	1.5	3.0	6.0	12.0	20.0	30
K, dB	55	44.5	43	42.5	33.5	32	29.5	25.5	31
E_R, (dB re 1 μV/m)/kHz	29	18.5	17	16.5	7.5	6.0	3.5	-0.15	5

Antennas used for measurements in the vhf and uhf frequency bands are antenna type 66095 and AT-150/SRC, respectively. The antenna factor for these vhf and uhf antennas is assumed to range from 4 dB to 7 dB.

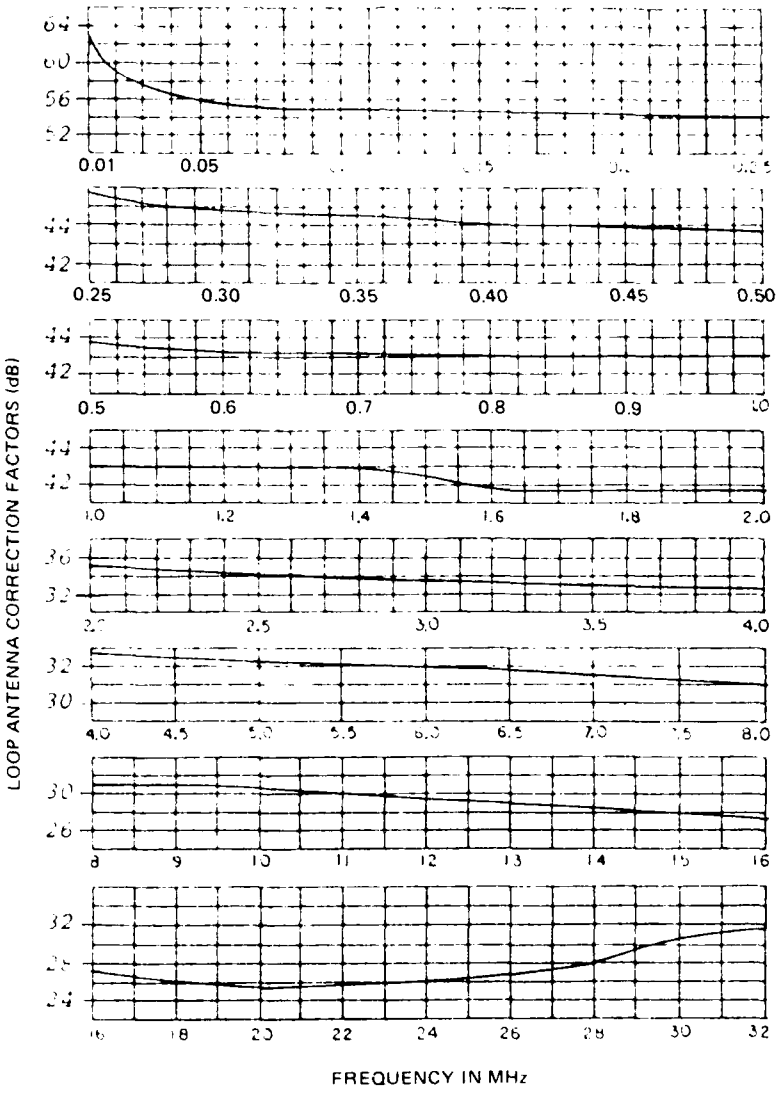

Figure 3.2. Loop antenna correction factor.

Let K = 4 dB, then

$$E_R = -13 \text{ (dB re 1 } \mu\text{V/m)/10 kHz for 30 MHz} \leq f \leq 400 \text{ MHz}$$

or $$= -23 \text{ (dB re 1 } \mu\text{V/m)/kHz}$$

Parabolic reflector antennas are used for measurements at frequencies above uhf; these antennas are highly directional. SESEF range has experienced interferences generated from navigation radars on commercial fishing boats and private pleasure craft. However, it is not expected that the interferences will be significantly increased due to the installation of the drilling platform. Therefore, interferences at frequencies above uhf will not be considered.

Figure 3-3 shows the values of E_B defined in equation (3) and the values of E_R calculated previously. Comparing the values of E_B and E_R at each frequency and selecting the larger value of E_B and E_R, one can establish E_M as the maximum tolerable interference level at the receiver site due to incoherent electromagnetic emissions from the drilling operations. For simplicity, E_M is established as

$$E_M = \begin{cases} 16.51 - 18 \log f \text{ for } 0.2 \text{ MHz} \leq f < 3 \text{ MHz} \\ 11.5 - 7.5 \log f \text{ for } 3 \text{ MHz} \leq f \leq 400 \text{ MHz.} \end{cases} \quad (4)$$

where

f is in MHz, and E_M is in (dB re 1 μV/m)/kHz.

3.2 DISTANCE REQUIREMENT

There are several man-made electromagnetic noise sources at the drilling platform, eg, welders, motors, and cranes. These industrial equipments emit incoherent electromagnetic noise which may interfere with the receiver at the SESEF range. In addition, communication transmitters located at the drilling platform will generate broadband noise which may also become a threat to the victim receiver at the SESEF range. Although the exact type and the number of

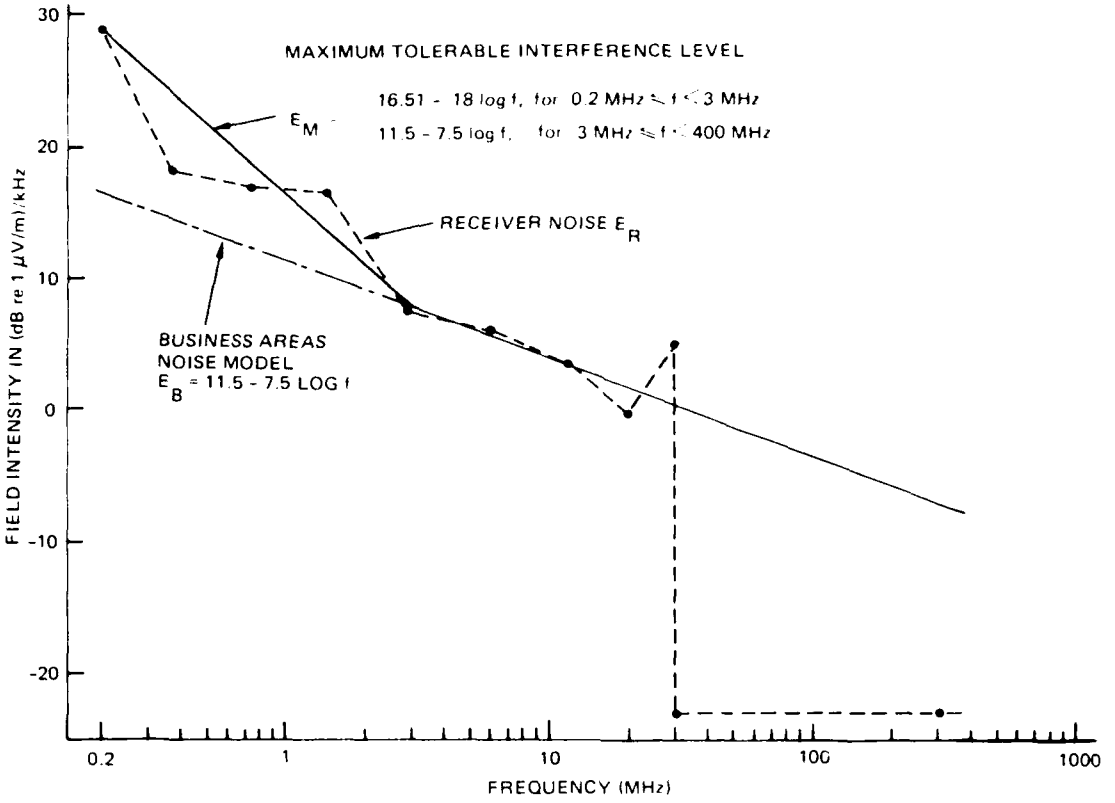

Figure 3-3. Maximum tolerable interference level at receiver site.

these interfering sources are unknown, it is assumed that there exists at least one rf stabilized arc welder installed on the drilling platform. Based on this assumption, a restriction on distance between the drilling platform and the receiver site at the SESEF range is established in this section. The field intensity of the interference signal due to an rf stabilized arc welder decreases as the distance away from the drilling platform increases. It is required at the receiver site of the SESEF range that the field intensity of the interfering signal must not exceed the maximum tolerable interference level discussed in the previous section.

Reference 12 gives the noise field intensity of an rf stabilized arc welder measured 1000 feet away from the welder. These data provide sufficient detail to determine both the frequencies of the dominant noise emission and the range dependence of interference in a typical industrial environment. The range variation of the dominant noise-field emissions in the mf and hf bands is proportional to d for the separation distance of 1000 feet to 1 mile. Dominant radiation bands for the spark-emission spectrum are identified in figure 3-4 at 750 kHz, 3MHz, and 20 MHz. The field intensities at these frequencies are 9, 20, and 15 (dB re 1 μV/m)/kHz. These field intensity values are compared with the maximum tolerable interference level; the results are shown in the following table.

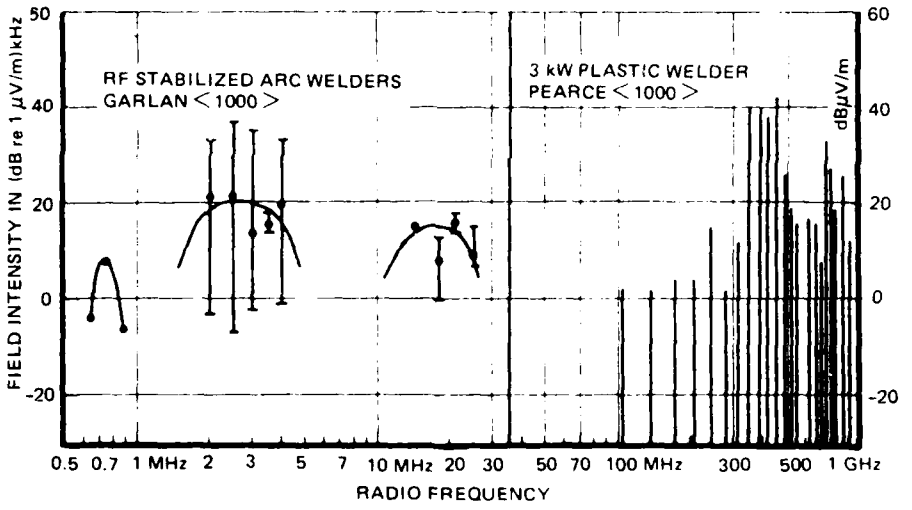

Figure 3-4. Rf stabilized arc welder and plastic welder noise.

12. Duff, WG and White, DR, A Handbook Series on Electromagnetic Interference and Compatibility, Don White Consultants, Inc, Germantown, MD, vol 5, p 7.30-7.33, 1972

Frequency MHz	Field Intensity in (dB re 1 μV/m)/kHz Welder Noise at 1000 Ft Distance	Maximum Interference Level at Receiver Site	Difference dB
0.75	9	18.76	- 9.76
3.00	20	7.92	12.08
20.00	15	1.74	13.26

The above table indicates that the difference between the two field intensities at the frequency of 20 MHz is the largest. Therefore, the field intensity at 20 MHz will be used to establish distance restriction on the drilling platform.

Since the range variation of the noise field emission is proportional to $d^{-1.5}$ for the separation distance of 1000 feet to 1 mile (5280 ft), an equation to relate the field intensity and the distance can be written. At frequency = 20 MHz and d = 1000 feet, the welder noise field intensity is

$$E_W = 15 \text{ (dB re 1 } \mu V/m)/kHz = 5.62 \text{ } (\mu V/m)/kHz.$$

Let $E_W = 20 \log \mathcal{E}_W$, one gets

$$\mathcal{E}_W = 5.62 \left(\frac{1000}{d}\right)^{1.5}$$

where

$\mathcal{E}_W$ is in (μV/m)/kHz and d is the distance separation from the drilling platform in feet. Converting (μV/m)/kHz into (dB re 1 μV/m)/kHz, one has

$$E_W = 20 \log 5.62 + 20 \log \left(\frac{1000}{d}\right)^{1.5}$$

$$= 20 \log 5.62 + 30 \log \left(\frac{1000}{d}\right)$$

$$= 105 - 30 \log d \qquad \text{for } 1000 \text{ feet} \leq d \leq 5280 \text{ feet}$$

This equation shows that the E_W decreases at the rate of 9 dB whenever the distance is doubled. It is required that

$$E_W = E_M = 1.74 \text{ (dB re 1 } \mu\text{V/m)/kHz}$$

at the receiver site of the SESEF range. Therefore, one obtains

$$1.74 = 105 - 30 \log d$$

$$d = 2767 \text{ feet}$$
$$\approx 0.5 \text{ nautical mile}$$

The drilling platform must be located at least 0.5 nautical mile away from the receiver site of the SESEF range.

3.3 TOLERABLE INTERFERENCE LEVEL VS DISTANCE FROM THE RECEIVER LOCATION

Since the distance requirement between the drilling platform and the receiver site at the SESEF range is based on the noise field intensity model for a stabilized arc welder, the same noise field intensity model will be used to establish the maximum tolerable interference level at any distance from the receiver location. As discussed in Section 3.2, the range variation of the noise field emission is proportional to $d^{-1.5}$ for the separation distance of 1000 feet to 1 mile (5280 feet). For distance exceeding 1 mile, it is assumed that the noise field emission is proportional to d^{-1}. The following equation describes the dependence of the maximum interference level on distance:

$$E_M(d) = E_M + 30 \log\left(\frac{1000}{d}\right) \qquad \text{for } 1000 \leq d \leq 5280 \text{ feet}$$
$$E_M(d) = E_M - 21.7 + 20 \log\left(\frac{5280}{d}\right) \qquad \text{for } 5280 \text{ feet} \leq d \tag{5}$$

where

E_M is defined in equation (4) and it is the maximum tolerable interference level at the receiver site.

$E_M(d)$ for frequency at 20 MHz is listed in the following table

Distance d, ft	$30 \log\left(\frac{1000}{d}\right)$ or $-21.7 + 20 \log\left(\frac{5280}{d}\right)$ E_M, dB	$E_M(d)$ (dB re 1 μV/m)/kHz
1000	0	1.74
2000	9.00	10.74
2767	13.26	15.00
* 3038 (0.5 nmi)	14.48	16.22
4000	18.10	19.84
5000	21.00	22.74
5280	21.70	23.44
* 6076 (1.0 nmi)	22.92	24.66
7000	24.15	25.89
8000	25.31	27.05
* 9114 (1.5 nmi)	26.44	28.18
*12152 (20 nmi)	28.94	30.68
*15190 (2.5 nmi)	20.88	32.62
*18228 (3.0 nmi)	32.46	34.20

* These values are shown in figure 3-5.

$E_M(d)$ for other frequencies can be calculated in the same way by using equations (4) and (5).

3.4 ADJACENT SIGNAL INTERFERENCE REQUIREMENTS

The previous two sections considered incoherent electromagnetic emissions from the drilling platform. This section discusses the coherent electromagnetic emissions which may cause adjacent signal interference, image frequency response, or spurious response to the receivers at the SESEF range.

Adjacent signal interference data are not available for EMI/field intensity meters. The manufacturer of the EMI/field intensity meters provides data only for undesired response rejections which include intermediate frequency rejection, image frequency rejection, and spurious rejection. The undesired response rejections and the rf bandwidth (3 dB point) of the EMI/field intensity meters are shown in the following table.

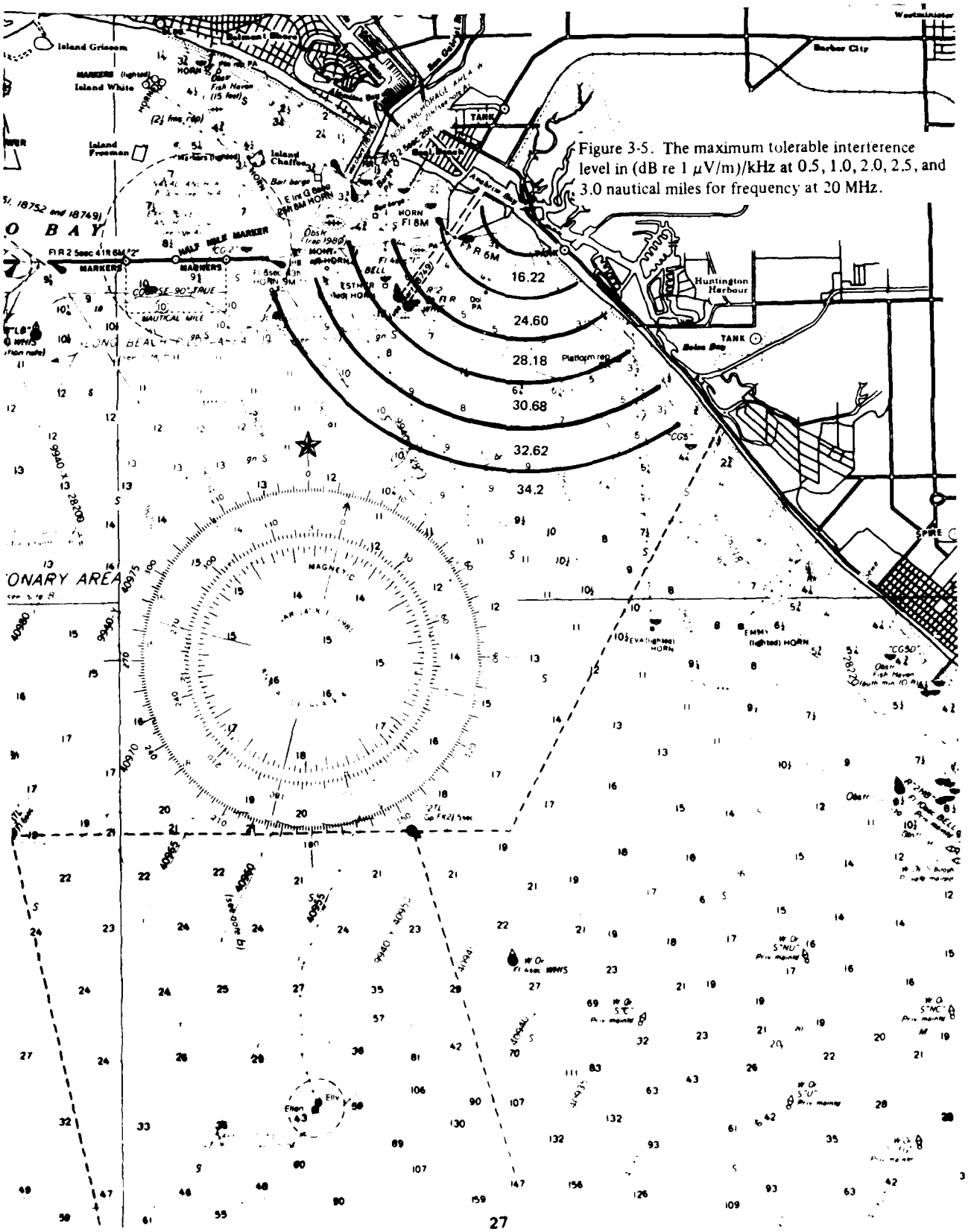

Figure 3-5. The maximum tolerable interference level in (dB re 1 μV/m)/kHz at 0.5, 1.0, 2.0, 2.5, and 3.0 nautical miles for frequency at 20 MHz.

Model	Undesired Response Rejection	RF Bandwidth
NM-17/27	70 dB minimum	1 MHz
NM-37/57	60 dB minimum	5 MHz
NM-67	60 dB minimum	50 MHz

Based on these available data, adjacent signal interference criteria can be established. The frequency separation requirement is that the interfering signal should be separated from the desired signal at least one half of the rf bandwidth of the receiver (the EMI/field intensity meters). The frequencies of the desired signal are listed in Appendix F. Furthermore, the field intensity of the adjacent interfering signal cannot exceed the sum of the maximum tolerable interference level and the undesired response rejection (either 70 dB or 60 dB) of the receiver.

4.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis of scattering effects, it is recommended that the following zones be excluded from drilling operations. No towers or platforms should be placed within 0.8 nautical mile of the SESEF transmit site. No towers or platforms should be placed within 0.8 nautical mile of the SESEF receive site. No towers or platforms should be located within a corridor 1 nautical mile wide extending from the SESEF transmit site to the SESEF receive site. These zones are represented by the shaded areas in figure 4-1.

Based on the data of the noise field intensity of an rf stabilized arc welder, it is recommended that the drilling platform not be located within 0.5 nautical mile of the SESEF receiver site. Noise field intensities measured at any distance from the SESEF receiver site for frequencies ranging from 0.2 MHz to 400 MHz should not exceed the values defined in equation (5) and as shown in figure 3-5. It is recommended that noise field intensities be measured before and after the installation of any drilling platform to make certain that they meet these requirements.

This study has not considered all possible combinations of tower locations, tower sizes and tower clusters. Neither has it considered all possible antenna configurations for the SESEF test range. To do so is a formidable task beyond the present time and resources available. However, this study has attempted to bound the scattering problem so that reasonable compromises can be made.

The study of the scattering problem has not considered multiple tower locations other than the clustering of towers within a 1000 metre circle. It is presumed that only a few drilling sites will be used and that they will be separated enough so that the single tower study applies. It is recommended that proposals to set up simultaneous drilling operations in three or more sites be evaluated on a case-by-case basis to determine the impact on SESEF testing.

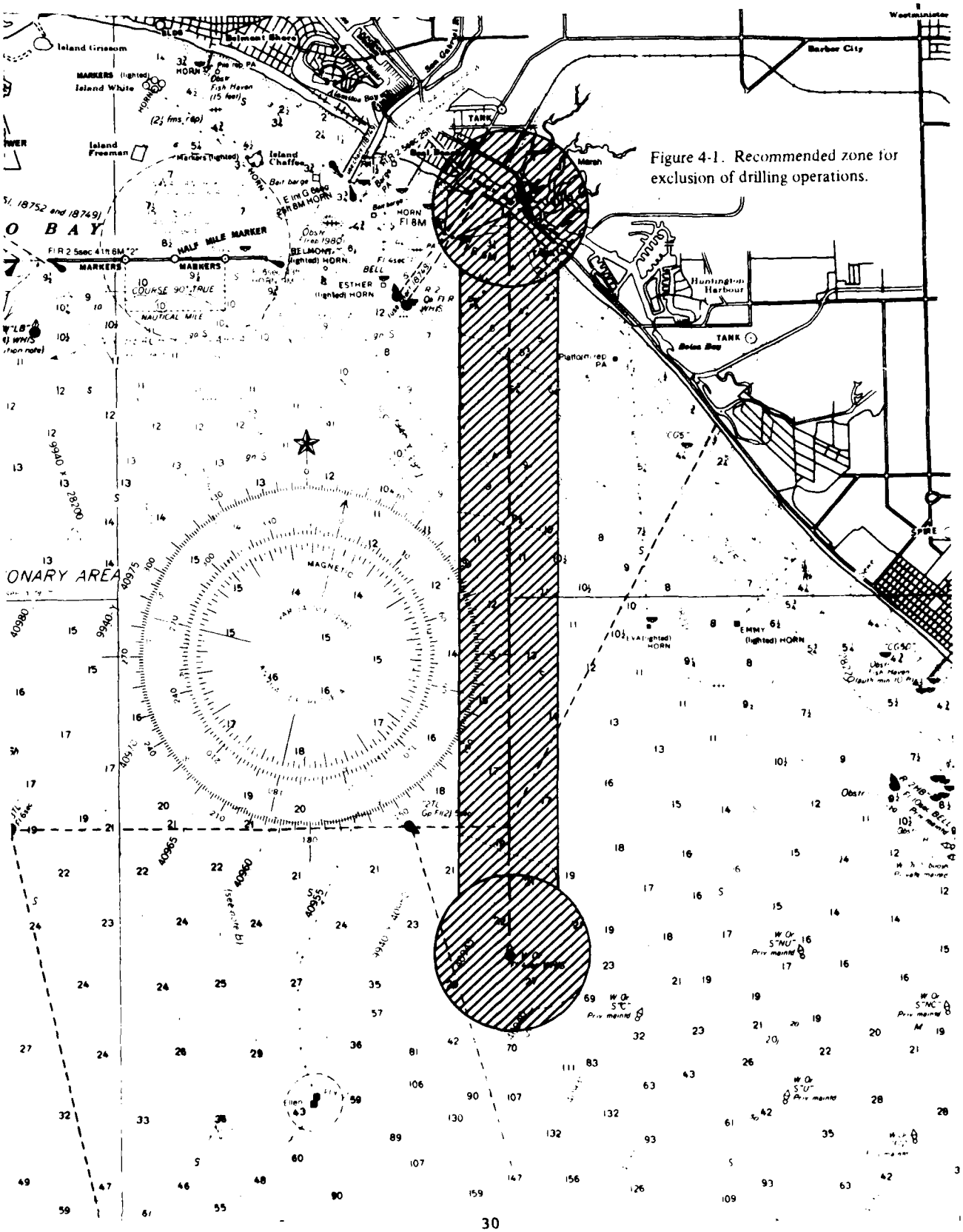

Figure 4-1. Recommended zone for exclusion of drilling operations.

5.0 REFERENCES

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Appendix A: Numerical Results - HF Data

********** PATTERN DEGRADATION IN (DB) **********

FREQUENCY 2.576 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-3.43	-.61	-.32	-.21	-.10	-.05	-.02	-.01
5.0	-3.49	-.67	-.37	-.26	-.15	-.08	-.03	.00
10.0	-3.66	-.81	-.48	-.34	-.12	.06	-.03	.03
15.0	-3.90	-.93	-.46	-.19	.16	-.08	-.01	.02
20.0	-4.13	-.81	-.07	.24	-.13	-.07	-.04	-.02
25.0	-4.22	-.31	.42	.18	.17	-.07	.01	.03
30.0	-4.01	.40	.25	-.34	-.09	.08	-.03	.02
35.0	-3.41	.78	-.46	.28	-.16	-.07	.01	.03
40.0	-2.48	.41	.05	-.21	-.11	-.06	-.03	-.02
45.0	-1.37	-.59	.35	.23	-.11	-.07	-.04	-.02
50.0	-.26	-.74	-.48	-.28	-.16	-.05	.04	.02
55.0	.72	.37	.39	.32	-.07	.08	-.02	-.01
60.0	1.49	.68	-.28	-.20	.15	-.07	-.01	.02
65.0	2.02	-.43	.20	-.10	-.01	.04	.04	.02
70.0	2.26	-.62	-.14	.31	-.09	.08	-.03	.02
75.0	2.21	.60	.15	-.07	.14	.03	.00	.00
80.0	1.83	.29	-.16	-.28	-.14	.00	.03	-.02
85.0	1.11	-.83	.21	.14	.15	-.02	.04	-.02
90.0	.06	.16	-.25	.27	-.14	-.02	.04	-.02
95.0	-1.26	.63	.29	-.13	.15	-.02	.04	-.02
100.0	-2.62	-.54	-.33	-.25	-.14	-.04	.04	-.01
105.0	-3.47	-.39	.33	.19	.14	-.06	.02	.02
110.0	-3.31	.65	-.34	.18	-.10	-.06	-.03	.00
115.0	-2.35	.13	.30	-.28	.02	.02	.03	.03
120.0	-1.16	-.77	-.22	.08	.12	.05	-.03	.03
125.0	-.11	-.06	.09	.15	-.08	-.05	-.03	-.02
130.0	.71	.65	.14	-.25	-.13	.01	.01	.00
135.0	1.29	.26	-.36	.27	-.08	.07	-.02	-.01
140.0	1.67	-.57	.35	-.27	-.07	.07	-.01	-.01
145.0	1.88	-.67	.00	.25	-.12	.03	-.02	.02
150.0	1.97	-.08	-.40	-.14	-.09	-.06	-.03	.00
155.0	1.97	.44	.06	-.11	.13	.03	-.01	.02
160.0	1.93	.64	.37	.26	-.09	.07	-.02	.00
165.0	1.86	.58	.27	.10	.12	.05	-.03	.03
170.0	1.80	.44	.03	-.16	-.11	-.06	.00	.02
175.0	1.75	.31	-.14	-.26	-.10	.06	-.03	.02
180.0	1.73	.26	-.19	-.27	-.06	.07	.01	-.02

PATTERN DEGRADATION IN (DB)

FREQUENCY 4.040 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-3.89	-.83	-.44	-.30	-.14	-.07	-.03	-.02
5.0	-3.95	-.93	-.54	-.39	-.21	-.09	.01	.04
10.0	-4.10	-1.11	-.63	-.38	.04	.05	.06	.02
15.0	-4.17	-.98	-.17	.22	-.04	.04	.06	.03
20.0	-3.94	-.18	.55	.18	.21	-.07	.04	.03
25.0	-3.19	.79	-.02	-.28	.17	-.09	-.05	-.03
30.0	-1.98	.77	-.38	.19	.21	-.09	.02	.04
35.0	-.58	-.63	.50	.15	.02	.08	.04	-.02
40.0	.73	-.60	-.52	-.41	-.10	.10	-.04	.02
45.0	1.75	.90	.38	-.14	.00	.07	.05	.00
50.0	2.37	-.28	-.03	.18	.20	-.07	.04	.03
55.0	2.49	-.39	-.42	.30	.12	-.05	-.02	-.01
60.0	2.03	.80	.46	.31	.09	-.03	.00	.01
65.0	.92	-.96	.20	.25	.16	-.09	-.03	.00
70.0	-.84	.74	-.48	.08	.16	.04	.00	.00
75.0	-2.66	-.56	-.28	-.18	-.07	-.02	.01	.01
80.0	-2.83	.38	.30	-.35	-.13	.07	-.03	.03
85.0	-1.15	-.13	.46	-.21	.16	-.08	.00	.03
90.0	.61	.03	.10	.14	-.03	.01	.03	.03
95.0	1.69	.20	-.39	.32	-.11	.08	-.04	.02
100.0	2.02	-.32	-.39	.19	.16	-.07	.03	.03
105.0	1.63	.51	.12	-.08	.00	.04	.04	.02
110.0	.64	-.69	.43	-.27	-.15	-.04	.04	-.01
115.0	-.73	.70	.01	-.31	-.08	.08	-.01	-.01
120.0	-1.94	-.67	-.43	-.30	.00	.04	.04	.02
125.0	-2.24	.30	.22	-.30	-.02	.06	.04	.01
130.0	-1.56	.29	.17	-.28	-.13	.05	-.03	.03
135.0	-.56	-.71	-.36	-.10	-.05	-.02	-.01	-.01
140.0	.32	.37	.38	.23	.12	-.07	-.01	.02
145.0	.94	.47	-.39	.12	-.06	-.04	-.02	-.02
150.0	1.31	-.47	.32	-.26	-.12	.05	-.03	.03
155.0	1.49	-.57	-.07	.27	-.07	.07	.01	-.02
160.0	1.54	.08	-.32	-.25	-.12	.04	-.02	.03
165.0	1.53	.52	.21	.06	-.01	.01	.01	.01
170.0	1.49	.61	.37	.26	.03	.00	.00	.01
175.0	1.45	.56	.27	.11	.12	.05	-.03	.02
180.0	1.44	.53	.21	.03	.06	.06	.03	.00

PATTERN DEGRADATION IN (DB)

FREQUENCY 6.970 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-4.79	-1.23	-.63	-.42	-.20	-.10	-.05	-.04
5.0	-4.83	-1.47	-.85	-.62	-.31	-.04	.07	-.05
10.0	-4.76	-1.61	-.63	-.10	.27	.01	.03	-.05
15.0	-4.06	-.25	.76	.34	.28	-.16	-.03	.03
20.0	-2.48	1.32	-.51	.08	.16	.14	-.07	.02
25.0	-.49	.01	.66	-.59	-.07	.13	.01	-.05
30.0	1.27	-.91	-.82	-.59	-.26	.05	-.01	-.01
35.0	2.42	1.18	-.27	-.53	.02	.07	.06	.01
40.0	2.68	-1.32	.38	.17	.04	.10	.04	-.04
45.0	1.82	.98	.52	.28	.25	-.12	.02	.04
50.0	-.40	-.29	.35	-.28	.23	-.12	.00	.04
55.0	-2.85	-.61	-.17	-.02	.12	.12	-.04	-.02
60.0	-1.48	1.05	-.69	.44	-.21	.05	-.03	.01
65.0	1.06	.01	.00	.05	.10	.11	-.02	-.03
70.0	1.92	-1.10	.56	-.29	.18	-.11	-.02	.02
75.0	.88	.01	-.49	-.39	.04	.00	.02	.02
80.0	-1.33	.87	.14	-.40	-.02	.05	.04	.01
85.0	-1.45	.54	.21	-.38	.00	.03	.04	.03
90.0	.52	-.49	-.43	-.35	.06	-.03	-.02	-.01
95.0	1.40	-.87	.49	-.31	.10	-.08	-.05	-.03
100.0	.71	-.01	-.44	-.30	.11	-.08	-.04	-.01
105.0	-.78	.74	.15	-.32	.07	-.05	-.04	-.03
110.0	-1.13	.32	.28	-.34	-.07	.07	.03	-.02
115.0	-.05	-.73	-.44	-.21	-.15	-.08	.02	.01
120.0	.80	-.05	-.12	.18	.15	.00	.00	-.01
125.0	.86	.62	.32	.18	-.14	-.07	.03	.00
130.0	.39	-.60	.39	-.29	-.10	.07	.00	-.03
135.0	-.15	.33	.37	.25	-.11	.07	-.01	-.03
140.0	-.42	-.16	.37	-.08	-.08	-.07	-.02	.02
145.0	-.47	.24	.20	-.27	.04	-.06	-.04	-.01
150.0	-.45	-.43	-.30	-.21	.13	-.01	-.01	.00
155.0	-.42	.50	.03	-.26	.06	-.07	-.01	.02
160.0	-.37	-.04	.05	-.06	-.09	-.07	.03	-.01
165.0	-.29	-.51	.13	.18	-.12	.06	.01	-.02
170.0	-.20	-.23	-.34	-.11	-.13	-.01	-.02	.01
175.0	-.13	.07	-.16	-.21	.12	.01	-.03	.02
180.0	-.10	.17	-.04	-.12	.07	.04	.02	.01

PATTERN DEGRADATION IN (DB)

FREQUENCY 8.190 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-4.94	-1.35	-.71	-.47	-.22	-.11	-.06	-.04
5.0	-4.95	-1.59	-.93	-.66	-.29	.03	.02	-.04
10.0	-4.69	-1.44	-.36	.19	.10	.15	-.03	-.03
15.0	-3.55	.40	.81	-.22	.04	.13	.03	-.05
20.0	-1.56	1.26	-.88	.57	-.16	.14	-.08	.03
25.0	.53	-1.38	.38	.53	-.30	-.12	.03	.04
30.0	2.05	.95	.73	.53	-.11	.14	-.05	-.01
35.0	2.63	-.98	.43	-.21	.01	.09	.05	-.03
40.0	1.92	1.14	.46	.06	.15	.11	-.07	.04
45.0	-.38	-.96	.66	-.34	-.16	-.08	-.04	-.03
50.0	-2.85	-.33	.18	.32	.16	-.09	-.05	-.04
55.0	-.95	.93	-.63	.42	-.13	.10	-.06	.02
60.0	1.37	.64	.51	.39	-.10	.10	-.04	.00
65.0	1.48	-.21	-.47	.25	.14	-.09	-.05	-.03
70.0	-.44	-.76	.46	-.17	-.05	.01	.03	.03
75.0	-1.61	-.84	-.48	-.28	.08	-.04	-.02	-.01
80.0	.22	-.67	.24	.27	-.16	-.06	.03	.00
85.0	1.14	-.44	.15	-.05	.04	.07	.01	-.03
90.0	.16	-.21	-.41	-.17	.13	-.07	.02	.01
95.0	-1.10	.01	.26	.26	-.04	.05	.02	-.01
100.0	-.27	.23	.07	-.20	-.13	-.07	.00	.02
105.0	.74	.43	-.30	-.07	.11	.03	-.03	.02
110.0	.47	.53	.32	.23	-.10	.05	-.03	.00
115.0	-.43	.40	-.33	.12	.11	-.01	.01	-.02
120.0	-.52	-.05	.28	-.02	.01	.02	.02	.01
125.0	.00	-.44	-.20	-.02	.01	.01	.01	.01
130.0	.15	-.02	-.10	.12	.09	-.01	.00	.00
135.0	.00	.31	.17	.11	-.09	-.01	-.01	.00
140.0	.10	-.28	.20	-.15	-.04	.02	.01	.01
145.0	.44	.21	.19	.10	-.08	.04	-.01	-.02
150.0	.62	-.23	.10	.11	.07	.04	.02	.00
155.0	.43	.25	-.18	.05	-.01	-.04	-.01	.01
160.0	-.05	-.07	.08	.14	.08	.04	.02	.01
165.0	-.63	-.29	-.11	.03	-.10	.03	-.01	-.02
170.0	-1.11	.00	.22	-.04	-.10	.04	.01	-.01
175.0	-1.39	.22	.03	-.16	.07	.02	-.01	-.02
180.0	-1.48	.28	-.08	-.07	-.05	-.05	.01	-.01

PATTERN DEGRADATION IN (DB)

FREQUENCY 12.045 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-5.79	-1.86	-.96	-.63	-.29	-.14	-.07	-.05
5.0	-5.62	-2.13	-1.21	-.80	-.16	.19	-.09	.02
10.0	-4.47	-.72	.55	.74	-.32	.07	.00	-.03
15.0	-1.99	1.59	-.66	.07	.28	.10	-.04	.01
20.0	.59	-1.38	.79	.28	.07	.16	.00	-.06
25.0	2.19	1.32	.86	.38	.26	-.15	-.08	-.06
30.0	2.19	-1.27	.44	.08	.20	.11	-.07	.04
35.0	.16	-.60	-.78	-.32	.21	-.12	-.07	-.05
40.0	-1.96	.42	.62	.09	.12	.11	-.06	.02
45.0	.12	.58	-.39	.25	.15	-.09	-.05	-.04
50.0	.97	.35	-.46	-.05	.16	-.01	.02	-.03
55.0	-.70	-.18	-.31	-.30	-.12	.04	-.03	.02
60.0	-.19	-.61	-.35	-.25	-.13	-.03	.03	-.02
65.0	.80	-.04	-.23	-.22	-.02	.04	.02	-.01
70.0	-.58	.47	.23	.06	.03	.05	.00	-.02
75.0	-.30	-.33	.03	.13	.08	-.05	-.03	-.01
80.0	.69	-.06	-.21	-.20	-.01	.04	.02	-.01
85.0	-.17	.40	.29	.21	-.05	.05	-.01	-.02
90.0	-.72	-.59	-.35	-.24	-.05	.05	-.01	-.02
95.0	.72	.46	.33	.23	-.05	.06	.00	-.02
100.0	.21	-.10	-.27	-.26	-.08	.05	-.03	.01
105.0	-1.10	-.38	.04	.21	-.13	-.05	.02	.00
110.0	.68	.53	.26	-.01	.06	.05	-.02	-.01
115.0	.40	.00	-.19	-.22	-.08	.04	-.03	.01
120.0	-.70	-.43	-.27	-.17	.03	-.02	-.02	-.02
125.0	-.03	-.19	-.20	-.16	-.03	.03	.02	.01
130.0	-.01	-.05	-.15	.02	.02	.01	.00	.00
135.0	.30	-.09	.07	-.03	-.02	-.04	.00	.01
140.0	.78	-.16	-.03	.12	.07	.02	-.01	-.02
145.0	-.18	.07	.11	.14	.04	-.03	-.01	.01
150.0	-1.91	.37	-.27	.19	.10	.03	-.01	-.02
155.0	-1.48	-.48	-.32	-.25	.09	-.03	-.02	.02
160.0	.38	.48	-.40	.20	.05	-.04	-.03	.02
165.0	1.65	-.72	.07	.27	.14	.06	.01	.00
170.0	2.22	.33	.01	-.15	-.16	.07	.03	.01
175.0	2.41	.73	.41	.23	-.09	-.01	-.05	-.02
180.0	2.44	.69	.22	-.07	-.12	-.05	.00	.01

PATTERN DEGRADATION IN (DB)

FREQUENCY 15.525 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-4.97	-2.14	-1.12	-.73	-.33	-.16	-.08	-.05
5.0	-4.35	-2.18	-1.22	-.72	.08	.11	.10	-.01
10.0	-2.34	.41	1.08	.34	.39	-.21	-.06	.02
15.0	.27	1.00	-.61	.41	.33	-.18	-.10	-.07
20.0	2.07	-.30	-.62	-.74	-.26	.11	-.06	.03
25.0	2.08	-1.21	.37	.02	.28	.02	.03	-.05
30.0	-.30	.15	-.08	-.27	.01	.10	.04	-.04
35.0	-1.30	.25	.60	.03	.19	.04	-.01	-.01
40.0	.97	-.36	.41	-.38	-.16	.03	-.01	-.01
45.0	-.23	-.61	.39	-.28	-.06	.07	-.02	-.02
50.0	-.39	.42	-.22	.17	-.07	-.03	-.01	-.01
55.0	1.04	-.28	.19	-.19	-.11	-.04	.02	-.01
60.0	-1.10	.30	-.23	-.02	.07	.03	-.02	.01
65.0	.57	-.41	-.15	-.04	.06	.04	-.03	.01
70.0	.12	.27	-.04	-.19	-.10	-.04	.02	.00
75.0	-.44	.29	-.07	.03	.08	.03	-.02	.01
80.0	.45	-.50	-.26	.11	.12	-.07	-.02	.01
85.0	.06	-.49	-.44	-.16	.12	-.07	-.04	-.02
90.0	-.44	.40	-.26	.15	.15	-.09	-.03	.00
95.0	1.30	.79	.21	-.14	.17	-.09	-.01	.02
100.0	-2.00	.05	.49	.20	.16	-.09	-.04	-.02
105.0	1.95	-.91	.50	-.34	-.02	.07	.02	-.03
110.0	-2.11	.14	.45	.23	-.10	-.04	-.02	-.01
115.0	1.18	.54	.39	.28	-.06	.07	-.02	-.02
120.0	.05	-.58	.00	.23	-.05	.05	-.01	-.02
125.0	-.60	.38	-.20	.07	-.01	.00	.01	.01
130.0	.48	-.20	.10	-.07	-.05	-.03	.00	.01
135.0	.14	-.06	.08	-.08	.04	-.01	-.01	.01
140.0	.11	-.11	.10	-.10	.06	.02	-.01	-.01
145.0	-.77	-.13	.15	.03	-.07	.01	-.02	-.02
150.0	-.04	-.25	-.16	-.13	.01	-.05	.02	-.02
155.0	1.02	-.38	.22	-.08	-.08	.02	-.01	-.02
160.0	.80	.29	-.02	-.16	.05	-.01	-.03	-.01
165.0	-.19	-.20	.07	.00	-.11	.03	-.02	-.02
170.0	-.99	.40	.21	-.04	-.12	.05	.01	-.01
175.0	-1.27	-.13	-.09	-.08	-.06	-.05	.02	-.02
180.0	-1.30	-.32	-.26	-.21	.10	.02	-.03	.00

PATTERN DEGRADATION IN (DB)

FREQUENCY 18.990 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-2.82	-2.18	-1.19	-.77	-.34	-.16	-.08	-.05
5.0	-2.27	-1.91	-1.07	-.53	.30	-.11	-.03	-.01
10.0	-.67	1.18	.93	-.57	-.14	.04	.10	.06
15.0	1.11	-.83	.95	-.74	-.12	.19	-.07	-.01
20.0	1.59	1.33	.73	.12	.33	-.11	.07	.02
25.0	-.30	.85	-.68	-.31	.01	.11	.03	-.04
30.0	-1.04	.81	-.47	.36	-.13	-.04	.00	.01
35.0	1.27	.52	-.48	.23	-.03	.04	.04	.01
40.0	-1.05	-.63	.20	.01	.12	-.05	.02	.01
45.0	.32	.48	-.26	.17	-.09	-.05	-.01	.01
50.0	.44	-.15	-.11	.13	-.06	.01	-.01	.00
55.0	-.51	-.37	-.15	-.12	-.04	-.02	-.01	-.01
60.0	.27	-.05	-.14	.13	-.03	.04	-.01	-.01
65.0	.12	.16	.24	.18	-.10	-.04	.02	.01
70.0	-.68	.22	-.27	.22	-.03	.06	.00	-.02
75.0	.81	.01	-.06	-.16	.00	.05	.03	-.01
80.0	-.69	-.58	.46	-.04	.17	-.02	.04	-.03
85.0	.27	-.78	.42	.11	.20	-.07	.04	.01
90.0	.86	.23	.00	-.05	.20	-.02	.04	-.04
95.0	-1.57	.93	-.50	.01	.18	.04	.00	-.01
100.0	1.73	.43	-.59	-.05	.20	-.02	.04	-.03
105.0	-2.11	-.46	.12	.28	.09	-.03	.00	.01
110.0	1.28	-.74	.39	-.25	-.11	-.05	-.03	-.02
115.0	-.90	-.59	-.36	-.25	-.11	.01	.01	-.01
120.0	.38	-.38	.19	-.12	-.04	-.02	-.02	-.01
125.0	-.10	-.15	.06	.07	-.04	.01	-.01	.00
130.0	.05	-.06	.02	.03	.02	.00	-.01	.00
135.0	-.24	.13	-.06	.07	.00	-.04	.02	-.01
140.0	.42	-.14	-.01	.06	-.03	-.04	.01	-.01
145.0	-.56	.30	-.15	.06	-.08	.03	.00	-.01
150.0	.57	-.01	-.05	.08	-.06	-.01	-.03	-.01
155.0	-.60	-.12	-.20	-.01	-.09	.04	.02	.01
160.0	-1.26	.09	.17	.09	-.02	-.04	.01	-.01
165.0	.55	.25	.02	-.11	.06	.03	.01	.00
170.0	1.76	-.27	.13	.02	-.06	.02	.00	-.01
175.0	2.12	-.03	-.11	-.11	.04	.00	-.01	.00
180.0	2.17	.17	.05	.02	-.04	.00	-.01	.00

********** PATTERN DEGRADATION IN (DB) **********

FREQUENCY 23.000 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-1.85	-2.10	-1.25	-.82	-.36	-.16	-.08	-.05
5.0	-1.73	-1.56	-.86	-.28	.46	-.25	-.04	.05
10.0	-.97	1.49	.10	-.82	-.11	.22	-.05	-.04
15.0	.11	-1.49	-.07	.72	-.31	.08	-.01	-.01
20.0	-.17	-.89	-.27	.57	-.21	.11	-.05	.04
25.0	-.76	-.97	-.67	-.33	.02	.09	.03	-.03
30.0	1.46	-.04	-.12	-.02	.15	-.08	-.04	-.01
35.0	-.84	.16	-.03	-.15	.05	.03	-.01	.01
40.0	.27	.53	.15	-.16	-.02	.02	.01	.00
45.0	.09	-.12	-.12	.12	-.03	.00	.01	.00
50.0	.46	-.19	.01	.09	.02	.02	-.01	.00
55.0	-1.03	.02	-.16	.09	.01	.02	.02	.01
60.0	.77	.21	-.07	.01	.10	.00	.01	-.02
65.0	.79	.15	-.32	-.12	.13	-.07	-.02	.01
70.0	-2.54	-.36	-.02	.21	-.06	.00	.02	.03
75.0	1.86	.31	.16	.03	.18	.02	.01	-.02
80.0	.62	.26	.12	.08	.13	.10	-.06	.03
85.0	-2.30	-.86	-.56	-.40	-.21	-.11	-.05	-.01
90.0	.90	.56	.46	.35	.07	.02	.05	.03
95.0	.94	.42	.19	.13	.10	.10	-.05	.01
100.0	-.59	-.79	-.50	-.35	-.17	-.09	-.03	.01
105.0	-1.14	.39	.38	.28	-.14	-.04	.03	.00
110.0	1.24	.03	-.28	-.14	-.02	.02	.02	.00
115.0	.59	-.15	.16	-.06	-.02	.01	-.01	.00
120.0	-2.07	.04	-.01	.02	.03	.00	-.01	.00
125.0	2.44	.48	-.07	-.13	-.03	.00	-.01	-.02
130.0	-3.23	.08	.25	.14	.09	.05	.02	.00
135.0	1.88	.06	-.28	.11	.05	.00	-.03	-.02
140.0	-1.42	.39	-.02	-.15	.08	.03	.01	.00
145.0	.30	.03	-.16	-.17	.09	.03	-.02	-.01
150.0	.04	-.03	.07	.10	.00	-.04	.01	.00
155.0	.76	-.24	-.14	.00	-.07	.03	.02	.01
160.0	-.77	-.18	.03	.06	-.06	.01	-.02	-.01
165.0	-1.53	-.31	-.10	.07	-.05	.00	-.02	.00
170.0	-.05	.29	-.09	-.03	-.06	.03	.01	.00
175.0	.90	-.25	-.01	.06	.00	-.03	.01	-.01
180.0	1.15	-.31	-.16	-.11	.03	-.02	-.01	.01

PATTERN DEGRADATION IN (DB)

FREQUENCY 26.775 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-3.91	-2.12	-1.39	-.92	-.40	-.18	-.09	-.06
5.0	-3.99	-1.21	-.54	.06	.48	-.04	.12	-.08
10.0	-2.50	1.39	-.96	.16	.39	.06	.03	-.05
15.0	-.15	.12	-.85	-.74	-.38	-.19	-.03	.04
20.0	.04	.03	.01	.25	.15	.11	-.06	.04
25.0	.72	.81	-.38	.18	.11	.04	-.01	.00
30.0	.86	-.92	.35	-.21	-.05	.01	.02	.01
35.0	-1.55	.14	.32	.02	.01	.01	-.01	.00
40.0	1.21	.50	-.13	-.13	-.01	.00	.00	.00
45.0	-.18	.00	.22	.01	.00	.01	-.01	.00
50.0	-.67	-.37	.15	-.09	.02	.02	-.01	.01
55.0	.21	.12	.15	-.18	-.10	-.02	.02	-.01
60.0	1.91	-.13	-.11	.23	-.07	.06	-.03	.01
65.0	-1.53	.36	-.39	.28	-.16	-.07	.02	.02
70.0	-1.61	.45	-.43	.20	.13	-.07	-.04	-.03
75.0	1.44	.49	.01	-.32	-.01	.07	.03	-.02
80.0	1.57	.60	.43	.14	.19	-.10	.00	.03
85.0	-.14	.58	-.54	.34	-.17	-.10	-.05	-.02
90.0	-1.22	.20	.49	-.09	.20	-.09	.02	.03
95.0	-.43	-.38	-.43	-.39	-.18	-.02	.04	-.03
100.0	-.08	-.65	.21	.04	.16	-.06	.03	.01
105.0	.65	-.54	.16	.15	.02	.05	.00	-.02
110.0	1.66	-.41	-.21	-.07	.04	.00	.01	-.01
115.0	-.92	-.53	-.14	-.02	.01	.00	-.01	.00
120.0	-1.80	-.43	-.22	.01	.01	.00	-.02	-.01
125.0	2.35	.60	.10	-.12	.08	.05	.01	-.01
130.0	-.82	-.52	-.23	-.15	-.03	.00	-.02	-.02
135.0	-.11	.17	-.13	-.07	.03	-.01	-.02	-.01
140.0	.44	.08	-.05	-.03	-.03	.01	-.01	-.01
145.0	-.38	.02	.07	-.05	.03	.01	.00	-.01
150.0	.83	.28	.09	.04	-.03	-.01	.00	.00
155.0	-1.14	-.20	-.09	-.07	-.04	.02	.01	.01
160.0	1.06	-.31	-.11	-.03	-.06	.02	.00	.00
165.0	-.39	-.17	.18	-.14	.07	.01	-.02	.00
170.0	-2.45	.32	.24	.04	-.11	.06	.03	.02
175.0	-1.37	-.16	.02	.05	-.14	.07	.03	.00
180.0	-.63	-.42	.34	-.26	.09	-.05	.02	-.01

Appendix B: Numerical Results - VHF Data

PATTERN DEGRADATION IN (DB)

FREQUENCY 36.900 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-4.35	-3.04	-.21	-3.39	-2.28	-1.60	-1.13	-.92
5.0	-5.80	-1.75	.11	1.03	-.48	-.07	.31	.42
10.0	-3.22	1.20	-.19	-.03	.58	.48	-.22	.24
15.0	1.57	1.40	-.38	-.82	.17	.29	.35	.00
20.0	1.87	-.39	-.79	.19	.20	.36	.05	-.14
25.0	-1.82	.70	-.32	.27	-.16	-.16	-.09	.01
30.0	.98	.22	.02	-.08	.14	.12	.12	.13
35.0	-.70	.64	-.16	-.13	-.12	.14	.09	.06
40.0	1.32	-.65	.30	.18	-.15	.10	-.04	-.03
45.0	-1.30	-.48	.26	.44	.29	.15	-.04	-.04
50.0	-.60	-.70	-.17	.31	.19	.09	-.01	-.04
55.0	1.11	.43	-.37	-.12	.15	.10	.06	.03
60.0	1.37	-.48	.32	-.09	.20	.19	.11	.02
65.0	.94	.45	-.38	.11	.17	.19	.04	-.02
70.0	.46	.66	-.17	-.19	-.11	-.06	-.04	-.03
75.0	.19	.62	-.40	.20	.26	-.14	-.04	.00
80.0	.15	.16	.01	.07	.27	-.07	.05	.11
85.0	.27	-.62	.38	.25	.12	.18	-.04	.07
90.0	.48	-.23	-.35	-.33	-.13	.09	.11	-.03
95.0	.71	.66	.49	.17	.28	-.04	.13	.09
100.0	.86	.52	-.44	.17	.03	.11	.15	.10
105.0	.90	-.09	.08	.09	.15	.18	.11	-.01
110.0	.79	-.34	.42	-.31	-.12	.20	.05	-.03
115.0	.39	-.03	.19	-.11	-.17	-.05	.14	-.03
120.0	-.48	.74	-.41	.20	-.18	.01	.07	.04
125.0	-1.66	-.44	.00	.25	-.20	.17	-.02	-.01
130.0	-1.17	.78	-.22	-.12	-.20	.19	.06	-.02
135.0	1.13	.49	.29	.15	-.07	-.12	.14	-.03
140.0	1.06	.78	.13	-.34	.16	-.09	.14	-.02
145.0	-1.86	-.50	.18	.43	.22	.00	-.01	.13
150.0	1.61	.70	.24	-.05	-.15	.06	-.06	.07
155.0	-1.91	.62	.03	-.19	-.01	-.09	.12	.01
160.0	1.47	-.78	.43	.05	-.21	.21	.15	.13
165.0	.50	.29	-.33	.44	.28	.18	.09	.04
170.0	-1.79	-.09	.57	-.02	-.17	.11	-.04	-.02
175.0	-1.57	-.02	.56	-.13	-.14	.10	-.03	-.03
180.0	-1.28	-.67	.01	.35	.00	-.06	.01	.15

PATTERN DEGRADATION IN (DB)

FREQUENCY 47.700 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-5.41	-5.53	-1.34	.50	1.63	2.24	2.64	2.81
5.0	-5.98	-1.15	.97	1.40	-.73	.40	.07	-.14
10.0	-1.73	-1.11	1.24	.53	.21	.58	.01	-.23
15.0	2.17	-1.40	.63	.25	.22	.42	.04	-.17
20.0	.10	.61	.63	.42	-.29	-.03	.19	-.09
25.0	-.47	.47	-.30	.34	.25	.09	-.04	.12
30.0	.52	-.58	.48	-.14	-.08	.00	-.05	.10
35.0	1.12	-.71	.49	-.02	-.23	.22	.12	.04
40.0	-.79	.22	.52	.37	-.08	.10	.01	-.05
45.0	-1.45	-.61	-.37	-.25	.28	.07	-.02	.13
50.0	-1.24	-.57	-.39	-.28	-.11	.17	-.03	.06
55.0	-1.30	.16	.39	-.29	-.03	.19	-.03	.09
60.0	-1.34	-.42	.13	.35	-.09	.07	.15	.06
65.0	-.22	.16	.14	-.13	.12	.19	-.04	.13
70.0	1.19	-.09	-.14	.36	.09	.12	.14	.03
75.0	.76	-.65	.38	.06	.15	.19	.06	-.03
80.0	-1.35	.48	-.05	.00	.11	.11	.12	.14
85.0	.25	-.14	.35	-.29	-.06	.13	.11	.12
90.0	1.22	.22	-.46	.11	-.07	-.09	.15	-.03
95.0	-1.22	-.01	.36	.42	.28	.20	.13	.08
100.0	-.03	-.07	-.03	.03	-.19	.20	.14	.13
105.0	1.39	.66	.35	.09	-.24	.16	.01	-.03
110.0	-.27	-.27	-.30	-.31	.33	.20	.11	.04
115.0	-1.55	-.58	-.08	.19	-.19	.04	.00	.11
120.0	-.14	-.10	.41	-.36	.22	-.11	.13	.07
125.0	.94	.72	.57	.34	-.21	.05	.06	.05
130.0	1.28	-.14	-.13	.38	-.21	.04	.09	.00
135.0	1.23	-.41	.30	-.08	.27	.13	-.02	.11
140.0	.63	.73	-.28	-.20	-.11	-.05	-.02	-.01
145.0	-1.12	-.67	.09	.43	-.26	-.09	.08	.13
150.0	-.69	-.54	-.48	-.39	-.17	.08	.11	-.03
155.0	1.46	.74	.50	.38	.12	.14	.14	.00
160.0	-1.66	.79	-.40	.22	.20	.20	-.07	.12
165.0	1.17	-.21	-.53	-.20	.21	.05	.15	.10
170.0	.91	.64	-.40	-.19	.21	.06	.15	.08
175.0	-.74	-.60	.44	.31	.08	.21	-.06	.13
180.0	-1.06	.41	-.01	.00	.29	-.08	.01	.09

PATTERN DEGRADATION IN (DB)

FREQUENCY 53.900 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-4.08	-6.10	-2.01	.14	1.46	2.15	2.58	2.77
5.0	-6.11	-.70	1.36	1.29	.24	.53	.42	-.28
10.0	-1.20	-2.04	-.26	.91	.53	-.16	.08	.22
15.0	2.23	.46	-.55	-.70	-.36	.27	-.12	.19
20.0	-.73	-.56	.28	.37	.28	-.07	.18	-.03
25.0	.56	.31	.32	.33	.05	-.09	.10	.06
30.0	-1.39	-.52	.30	.45	.23	-.03	-.01	.15
35.0	.70	.66	-.26	-.31	.29	.23	.18	.14
40.0	1.24	-.35	.06	.29	.26	.21	.00	-.03
45.0	1.21	.16	-.36	-.15	.25	-.03	.14	.00
50.0	1.15	-.11	-.39	.18	.26	-.09	-.02	.03
55.0	.37	.32	.29	.24	.16	.12	.11	-.03
60.0	-1.34	-.48	-.22	-.09	.11	.20	-.03	.08
65.0	.28	.51	.50	.28	.26	-.08	.09	.12
70.0	.94	-.52	.48	-.31	.21	-.12	-.01	.09
75.0	-1.35	-.64	-.41	-.28	-.06	.10	.06	.04
80.0	1.31	-.64	.46	-.17	.09	-.05	.00	.12
5.0	-1.43	-.21	.45	.31	.05	-.10	.15	-.03
0.0	1.32	.55	.21	.01	-.19	.16	.03	-.03
95.0	-1.45	.65	-.10	-.14	.11	.03	-.04	-.02
100.0	1.33	.15	-.48	.22	.16	.14	.13	.12
105.0	-1.31	-.13	.29	.42	-.14	.20	-.01	.00
110.0	1.00	.20	-.41	.44	.02	.12	.15	.11
115.0	.11	.74	-.17	-.30	.16	.05	.10	.12
120.0	-1.23	-.73	-.32	.01	.34	-.06	.16	.09
125.0	1.09	-.04	-.44	-.36	-.12	.10	.12	-.03
130.0	1.34	-.35	.07	.30	.12	.24	-.02	.08
135.0	.72	.11	-.12	-.25	-.06	.16	.13	-.03
140.0	.54	-.71	-.16	.44	-.21	-.12	-.07	.00
145.0	1.09	.15	-.24	-.38	-.22	-.04	.15	.07
150.0	1.43	-.66	.20	.31	-.10	-.04	-.02	.02
155.0	-.82	-.73	.04	.44	.14	.01	.05	.08
160.0	.38	.47	-.50	.46	.12	.02	.05	.07
165.0	-.46	-.13	-.02	.08	.10	.17	.19	.07
170.0	1.49	.76	.51	.33	.36	.00	.15	-.03
175.0	.51	.58	-.54	.24	.31	.17	-.09	.12
180.0	.11	.63	.61	.30	-.25	-.10	.18	.05

PATTERN DEGRADATION IN (DB)

FREQUENCY 72.920 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-6.23	-3.48	-3.87	-.95	.95	1.88	2.42	2.64
5.0	-6.97	.69	1.74	-.54	.15	.69	.23	-.43
10.0	.49	1.00	1.15	.95	.10	.34	.36	-.01
15.0	1.39	-.60	.52	-.36	.19	-.12	-.07	.04
20.0	-1.47	.56	-.05	-.11	-.10	-.02	-.03	.15
25.0	.23	.77	.45	-.10	-.27	.24	.07	-.04
30.0	1.02	.45	-.31	-.26	.29	.13	-.07	.12
35.0	.90	.02	-.35	-.17	-.10	-.06	-.03	-.02
40.0	.01	-.08	-.22	-.27	-.04	.15	.06	-.02
45.0	-1.05	.57	.00	-.20	.21	-.05	-.01	.02
50.0	1.11	.59	.41	.25	.25	.11	-.02	.11
55.0	-.99	-.28	.07	.28	-.15	.18	.12	.07
60.0	.10	-.15	.29	-.18	.05	-.10	.14	-.02
65.0	1.15	.52	.13	-.17	.10	-.03	-.04	.07
70.0	.85	.39	.31	.26	.21	.19	.11	.00
75.0	.37	.35	.43	.42	.06	.10	.16	.11
80.0	.14	.67	-.08	-.30	-.17	-.09	-.06	-.02
85.0	.16	-.31	.49	-.36	-.19	-.07	.07	.11
90.0	.33	-.09	-.20	-.24	.20	-.02	.03	.06
95.0	.51	.58	-.41	.01	.18	.20	.06	-.03
100.0	.63	-.58	.54	-.11	.20	.17	.15	.11
105.0	.55	-.42	-.50	-.13	-.22	.16	-.01	-.04
110.0	.13	-.36	-.47	-.39	.31	.07	-.05	.08
115.0	-.82	-.58	.19	.48	.30	.20	.06	.00
120.0	-1.31	.56	-.18	.10	-.16	-.02	.04	.10
125.0	.74	.73	.18	-.32	-.09	.14	.10	.11
130.0	.52	-.37	-.53	-.27	.30	.17	-.06	.07
135.0	-.34	.49	-.44	.48	.16	-.05	-.05	-.04
140.0	-.35	-.69	-.42	.04	.15	.24	.08	-.03
145.0	1.26	-.31	-.42	.36	-.18	-.11	-.06	-.03
150.0	1.31	.35	-.26	-.43	-.14	.16	.00	.07
155.0	1.35	.69	.34	.02	.35	-.04	.15	.06
160.0	.38	-.15	.34	-.24	.21	.05	.15	.09
165.0	-1.08	.43	-.03	-.03	.27	.04	.16	.03
170.0	.83	-.37	-.56	-.08	.31	-.08	.03	.09
175.0	1.13	.10	-.45	.48	-.19	-.02	.12	.15
180.0	.73	.64	.62	.51	-.22	-.07	.05	.11

PATTERN DEGRADATION IN (DB)

FREQUENCY 133.740 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-5.90	-2.94	-2.40	-1.94	-.63	1.11	2.00	2.33
5.0	-5.64	2.07	-1.76	1.33	.23	.44	.53	.04
10.0	1.18	.34	.29	.28	-.08	.08	.00	-.03
15.0	-2.00	.90	-.64	.52	-.01	-.08	-.14	.00
20.0	-.88	-.37	-.32	-.28	-.13	.07	.08	-.03
25.0	-.69	.53	-.23	.21	.30	-.14	.05	.13
30.0	.44	.54	.41	.30	-.08	.09	.03	.00
35.0	1.08	.27	-.29	-.28	.05	-.08	.00	.11
40.0	.50	-.49	.02	.36	-.13	.13	-.02	.09
45.0	-.95	-.03	.40	.32	.05	.17	.03	-.02
50.0	.23	.62	.16	-.27	.23	-.06	.12	-.03
55.0	.97	.52	.24	.07	-.22	.16	.09	.05
60.0	.65	.64	.44	.26	.22	.18	.06	-.02
65.0	-1.04	-.41	.39	.24	-.01	.14	.09	-.03
70.0	.52	.31	.34	.38	-.19	-.11	-.03	.03
75.0	-.41	-.65	-.22	.26	-.22	.05	-.02	.11
80.0	1.15	-.68	.46	-.16	.01	-.11	.11	.02
85.0	-1.05	-.03	.41	.42	.03	.00	-.04	-.04
90.0	-.41	.60	.48	.09	.20	.19	-.06	.11
95.0	1.30	-.73	.51	-.39	-.23	-.14	-.04	.00
100.0	.00	.17	.31	.40	-.24	-.10	.13	.06
105.0	-.99	.38	-.06	.11	-.05	-.12	.03	.12
110.0	1.32	-.76	.40	.04	-.19	.05	-.09	.02
115.0	-1.23	.18	.32	-.40	.19	-.13	.17	-.04
120.0	-.01	-.76	.15	.47	.30	-.11	.14	.03
125.0	1.20	-.79	.52	-.22	-.18	-.12	-.09	-.05
130.0	1.12	-.11	-.46	-.39	.02	.22	-.07	.13
135.0	-.86	.71	-.48	.50	-.26	-.06	.13	.12
140.0	.74	-.82	.43	.12	.34	.06	.12	-.07
145.0	-1.68	.76	-.38	.31	-.16	-.14	-.07	.04
150.0	-1.72	.23	.56	-.14	.27	.23	.11	-.03
155.0	.30	-.46	-.53	-.33	.36	.14	-.08	.07
160.0	-.54	.01	.39	-.44	.02	-.08	-.05	.13
165.0	.74	.74	.57	.41	.29	.17	.08	.03
170.0	-1.07	.08	.46	-.47	.33	.10	-.09	.00
175.0	1.21	-.01	-.47	-.39	.33	.19	.09	.03
180.0	-.07	.80	-.44	-.03	-.32	.19	.04	-.03

PATTERN DEGRADATION IN (DB)

FREQUENCY 138.780 MHZ DRILL TOWER HEIGHT 73.40 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-6.23	-3.66	-2.12	-1.80	-.75	1.04	1.97	2.31
5.0	-5.26	1.93	-1.37	1.03	.84	-.61	-.47	-.39
10.0	1.14	.53	.45	.32	.21	.11	.01	-.03
15.0	-1.99	.42	.57	-.32	-.25	.26	.21	.16
20.0	-1.16	.04	.34	-.31	-.10	.11	.07	-.03
25.0	.29	-.11	-.07	-.06	.28	.05	.09	-.03
30.0	-.68	.47	-.35	.34	.25	.17	.13	.11
35.0	-.28	-.27	-.36	-.31	.11	-.09	.01	.11
40.0	-1.15	.54	-.26	.25	.23	-.07	-.02	.00
45.0	1.10	-.46	.05	.33	-.16	-.10	-.04	.02
50.0	.07	.00	.30	-.28	-.04	.03	-.04	-.02
55.0	-.11	.43	.44	.09	-.20	.12	-.04	.01
60.0	.99	.06	-.21	.38	-.15	.16	-.05	.11
65.0	-.01	-.38	-.41	-.19	.11	.15	.06	-.03
70.0	.39	.63	-.32	.01	.16	.17	.13	.05
75.0	-1.19	-.02	.31	.42	.29	.16	.02	-.03
80.0	.69	.42	-.42	.05	-.19	-.04	.08	.02
85.0	1.29	-.33	-.28	.39	-.23	.06	.07	-.01
90.0	.80	-.52	-.39	.09	.29	-.07	.04	.09
95.0	-.33	-.64	-.46	-.29	-.21	-.13	.01	.10
100.0	-1.46	-.63	-.19	.00	-.04	-.12	.02	.12
105.0	-.44	.77	.09	-.42	.32	.19	.12	.05
110.0	1.39	-.06	-.44	.32	.16	.06	.00	-.03
115.0	-1.17	.75	-.49	.48	-.02	.10	.13	.14
120.0	1.37	.05	-.49	-.12	.04	.19	.06	-.04
125.0	-.66	.07	.27	-.31	-.02	.22	-.07	.12
130.0	-1.42	-.77	-.52	-.43	-.13	.22	-.07	.08
135.0	-.31	.06	.15	.21	.31	.19	-.07	.06
140.0	1.39	.77	.15	-.30	-.28	.19	-.04	-.05
145.0	-.43	.43	-.26	.37	-.22	.18	.11	.07
150.0	-1.35	-.75	-.51	-.46	.32	.14	-.06	-.03
155.0	.54	.45	-.51	.46	.24	-.02	-.03	.15
160.0	-.25	.83	.19	-.46	.36	.25	.09	-.01
165.0	1.21	.20	-.22	-.42	.10	-.15	.03	.13
170.0	-.03	.13	.09	-.04	-.12	-.16	.12	.05
175.0	.30	-.36	-.50	-.45	.16	-.16	.03	.15
180.0	-1.31	.85	-.29	-.04	-.06	-.15	-.02	.1

PATTERN DEGRADATION IN (DB)

FREQUENCY 140.800 MHZ DRILL TOWER HEIGHT 73.400 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-6.64	-3.97	-2.01	-1.74	-.80	1.02	1.96	2.30
5.0	-5.02	1.87	-1.18	.86	.97	-.71	-.20	.22
10.0	1.14	.59	.44	.18	-.04	-.11	.12	.00
15.0	-1.90	-.04	.59	.39	.27	.21	.16	.15
20.0	-1.24	.49	-.26	.30	.14	.12	.10	-.03
25.0	.62	.63	.31	-.17	-.08	-.06	-.03	-.03
30.0	-1.05	.10	.35	.37	.20	.02	-.04	.09
35.0	-.92	.30	-.06	.08	-.05	-.09	.00	.10
40.0	-.64	-.56	-.37	-.30	-.07	.17	-.04	.10
45.0	.57	-.40	-.18	.35	-.18	-.09	.07	.10
50.0	1.10	.16	-.37	.28	-.14	.13	.06	.02
55.0	1.13	.64	.40	.25	-.16	.17	.12	.09
60.0	.41	-.49	.45	-.34	-.02	.20	.03	-.02
65.0	-.82	.60	.02	-.23	.06	.16	.06	-.03
70.0	.52	.44	-.40	.01	.04	.00	-.04	-.05
75.0	1.03	-.05	-.10	.32	.12	-.09	.08	.05
80.0	-.31	.64	-.44	.40	.30	.08	-.03	.13
85.0	-1.26	.51	.04	-.22	.29	-.13	-.05	.01
90.0	-1.43	-.28	.15	.36	.07	.20	.01	-.02
95.0	-1.05	-.72	-.11	.33	-.26	-.09	.16	-.01
100.0	-.16	-.54	.51	-.16	-.25	.23	.07	-.01
105.0	1.05	-.73	.27	.25	-.20	.08	-.03	-.06
110.0	1.08	.73	.53	.40	-.20	.20	.12	.03
115.0	-1.56	.74	-.32	.22	.31	.08	.07	-.05
120.0	1.41	-.38	-.18	.48	-.27	-.14	-.06	-.02
125.0	-.84	.79	.05	-.42	-.31	-.14	.03	.11
130.0	-1.64	.76	-.38	.33	-.19	-.18	-.02	.10
135.0	-1.31	.73	-.47	.49	-.07	.10	.05	.03
140.0	1.32	.69	-.05	-.43	.35	.17	-.06	-.01
145.0	-1.69	.29	.48	-.38	.08	-.16	.15	-.05
150.0	-1.08	-.84	-.49	-.26	.04	-.19	.14	-.01
155.0	-1.62	.84	-.37	.11	-.30	.18	-.05	-.02
160.0	1.49	.05	-.52	.32	.17	.09	.05	.03
165.0	.91	.57	.42	.38	-.30	.23	.01	-.05
170.0	1.50	-.37	-.17	.51	.27	-.16	.07	.12
175.0	-1.66	.28	.57	-.10	.21	.16	.16	.11
180.0	-.27	-.87	-.04	.48	-.18	.24	.03	-.06

PATTERN DEGRADATION IN (DB)

FREQUENCY 36.900 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	1.10 KM	1.20 KM	1.30 KM	1.40 KM	1.50 KM	1.60 KM	1.70 KM	1.80 KM
ANGLE	0.59 NM	0.64 NM	0.70 NM	0.75 NM	0.81 NM	0.86 NM	0.91 NM	0.97 NM
.0	-3.19	-3.02	-2.89	-2.77	-2.66	-2.57	-2.49	-2.41
5.0	1.15	1.19	1.16	1.05	.87	.64	.38	.08
10.0	-1.12	-.59	.59	.99	.35	-.69	-.77	.19
15.0	.91	-.73	.50	.05	-.27	.65	-.70	.68
20.0	-.63	.03	.63	.06	-.53	.12	.58	-.04
25.0	.47	.33	-.04	-.32	-.26	.06	.33	.36
30.0	-.11	.34	-.14	.00	.28	-.17	.08	.22
35.0	-.24	.14	.32	.06	-.21	-.02	.30	.18
40.0	-.09	-.27	-.26	-.08	.14	.29	.31	.20
45.0	-.25	.14	.20	-.24	.35	-.15	.07	.21
50.0	.03	-.13	.35	-.26	.23	.05	-.12	.31
55.0	-.26	.20	.32	-.08	-.21	.17	.28	-.06
60.0	-.27	-.16	.11	.30	.27	.06	-.15	-.17
65.0	.28	.34	.28	.13	-.04	-.17	-.19	-.10
70.0	.01	.20	.36	.32	.23	.09	-.06	-.16
75.0	.36	.34	.17	-.05	-.20	-.20	-.06	.13
80.0	-.25	-.23	.07	.31	.27	.01	-.20	-.13
85.0	.36	-.07	-.26	.11	.33	.05	-.21	.02
90.0	.22	.26	-.25	.06	.30	-.14	-.05	.29
95.0	-.26	.36	-.12	.01	.27	-.22	.23	.05
100.0	.07	-.07	.25	-.21	.32	-.22	.28	-.12
105.0	.02	.10	.00	.12	-.02	.13	-.03	.14
110.0	.39	-.29	.36	-.26	.33	-.22	.29	-.17
115.0	.23	-.13	.24	-.15	.25	-.16	.26	-.17
120.0	.00	.03	.16	-.11	.26	-.19	.30	-.21
125.0	.17	-.27	.35	-.06	-.08	.32	-.19	.11
130.0	-.32	.08	.37	.15	-.22	-.13	.23	.27
135.0	.12	.09	.06	.04	.01	-.01	-.03	-.04
140.0	.22	.35	-.14	-.20	.26	.25	-.17	-.10
145.0	-.17	.03	.28	-.27	.31	-.05	-.04	.28
150.0	-.12	-.17	-.21	-.24	-.25	-.25	-.23	-.21
155.0	.34	-.28	.37	-.28	.35	-.22	.28	-.13
160.0	-.23	-.32	-.18	.07	.27	.34	.24	.05
165.0	.26	-.18	-.28	.07	.34	.22	-.12	-.21
170.0	-.04	.28	-.26	.37	-.24	.24	-.02	.01
175.0	.06	.21	-.22	.36	-.26	.29	-.08	.07
180.0	.01	-.15	.37	-.23	.15	.17	-.21	.30

PATTERN DEGRADATION IN (DB)

FREQUENCY 47 .0 MHZ DRILL TOWER HEIGHT 73.400 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	1.10 KM	1.20 KM	1.30 KM	1.40 KM	1.50 KM	1.60 KM	1.70 KM	1.80 KM
ANGLE	0.59 NM	0.64 NM	0.70 NM	0.75 NM	0.81 NM	0.86 NM	0.91 NM	0.97 NM
.0	.71	.88	1.03	1.15	1.25	1.35	1.43	1.50
5.0	1.24	.95	.51	.12	-.35	-.75	-1.03	-1.11
10.0	1.07	-.11	-1.03	.25	.08	.05	-.91	.05
15.0	-.29	.56	-.57	.64	-.65	.66	-.51	.48
20.0	.32	.22	.12	.01	-.08	-.16	-.23	-.27
25.0	-.24	.32	-.22	.30	-.20	.28	-.18	.27
30.0	-.30	-.22	.02	.25	.33	.24	.03	-.15
35.0	-.28	-.33	-.17	.10	.30	.36	.25	.04
40.0	.23	-.30	.00	.37	-.01	-.24	.20	.27
45.0	.36	.01	-.18	.32	-.02	-.13	.30	-.04
50.0	.10	.30	-.18	.00	.29	-.10	-.06	.27
55.0	.06	.34	.17	-.17	-.15	.17	.28	.04
60.0	.37	.36	.34	.29	.24	.17	.10	.03
65.0	-.30	-.04	.29	.31	.03	-.21	-.11	.17
70.0	-.28	.36	-.26	.33	-.20	.26	-.12	.22
75.0	.38	.21	-.17	-.21	.12	.31	.13	-.18
80.0	.29	.36	.20	-.07	-.23	-.15	.07	.25
85.0	.38	-.28	.36	-.25	.32	-.20	.26	-.13
90.0	.28	.37	.35	.26	.11	-.04	-.16	-.21
95.0	-.13	-.19	.33	.10	-.24	.17	.24	-.18
100.0	-.27	.34	.07	-.24	.28	.11	-.21	.22
105.0	.02	-.04	-.09	-.13	-.17	-.19	-.21	-.21
110.0	.11	.30	-.29	.20	.17	-.23	.26	.06
115.0	.24	-.31	.32	.03	-.16	.33	-.13	.01
120.0	-.13	.17	.36	.34	.14	-.10	-.23	-.17
125.0	.25	.16	.08	.00	-.07	-.13	-.17	-.20
130.0	.08	-.22	-.30	-.13	.14	.32	.30	.12
135.0	-.34	-.21	.13	.36	.29	.01	-.22	-.18
140.0	.05	.26	.37	.40	.24	.06	-.11	-.22
145.0	.44	.40	.34	.24	.14	.03	-.07	-.15
150.0	.20	.33	-.27	.03	.35	-.14	-.10	.32
155.0	.12	-.31	.32	.13	-.26	.27	.12	-.23
160.0	.43	.37	.11	-.17	-.28	-.15	.10	.29
165.0	-.23	.36	.19	-.29	.05	.35	-.05	-.20
170.0	.40	-.34	.36	-.13	.07	.19	-.20	.33
175.0	.39	-.13	-.29	.17	.36	-.01	-.25	.04
180.0	-.34	-.21	.18	.38	.22	-.12	-.25	-.09

PATTERN DEGRADATION IN (DB)

FREQUENCY 53.900 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	1.10 KM	1.20 KM	1.30 KM	1.40 KM	1.50 KM	1.60 KM	1.70 KM	1.80 KM
ANGLE	0.59 NM	0.64 NM	0.70 NM	0.75 NM	0.81 NM	0.86 NM	0.91 NM	0.97 NM
.0	.39	.59	.76	.90	1.03	1.13	1.23	1.31
5.0	.89	.38	-.20	-.74	-1.12	-1.23	-1.07	-.69
10.0	-.82	-.47	.95	.34	-.95	.13	.88	-.19
15.0	.63	-.15	-.17	.58	-.54	.39	.11	-.33
20.0	.23	.05	-.12	-.23	-.28	-.19	-.07	.08
25.0	-.23	.01	.32	-.12	-.07	.30	-.03	-.13
30.0	-.35	.30	.00	-.09	.33	-.28	.34	-.09
35.0	-.18	.36	.25	-.25	-.12	.32	.21	-.21
40.0	.36	.00	-.27	-.05	.27	.26	-.05	-.20
45.0	-.18	.26	.21	-.18	-.05	.27	.10	-.17
50.0	.09	-.13	.30	-.23	.28	-.09	.07	.14
55.0	.22	-.29	.21	.19	-.24	.19	.18	-.20
60.0	-.05	-.03	.00	.02	.04	.05	.07	.07
65.0	-.30	.30	.00	-.10	.31	-.23	.14	.14
70.0	-.18	.15	.34	.23	-.05	-.21	-.14	.15
75.0	.03	.35	-.19	-.01	.31	-.13	-.04	.29
80.0	-.32	-.18	.11	.31	.31	.13	-.10	-.21
85.0	-.31	.37	-.17	.11	.16	-.17	.31	-.18
90.0	-.04	-.08	-.11	-.14	-.16	-.17	-.18	-.19
95.0	.31	-.26	.36	-.31	.32	-.17	.20	-.03
100.0	.37	.39	.29	.12	-.07	-.20	-.27	-.14
105.0	-.07	-.12	.37	-.22	.10	.23	-.28	.24
110.0	.36	.12	-.15	-.28	-.19	.03	.23	.31
115.0	.43	-.30	.28	-.02	-.02	.25	-.22	.35
120.0	.09	.16	.22	.26	.29	.31	.35	.32
125.0	.03	.41	-.10	-.21	.31	.14	-.24	.10
130.0	-.25	.37	-.30	.38	-.27	.33	-.21	.24
135.0	.44	.07	-.30	.27	.21	-.30	.11	.28
140.0	-.11	-.31	.19	.36	-.06	-.25	.15	.31
145.0	.28	.30	-.29	.00	.37	-.06	-.19	.28
150.0	-.29	.41	-.32	.37	-.22	.24	-.05	.03
155.0	-.18	-.24	.33	.23	-.26	-.02	.34	.04
160.0	.41	.18	-.12	-.29	-.31	-.03	.20	.36
165.0	.38	-.33	.15	.28	-.29	.20	.18	-.25
170.0	.24	-.35	.18	.30	-.26	.06	.32	-.16
175.0	.41	.42	.26	.03	-.18	-.27	-.20	-.03
180.0	.18	.07	-.04	-.12	-.19	-.24	-.26	-.26

PATTERN DEGRADATION IN (DB)

FREQUENCY 72.920 MHZ DRILL TOWER HEIGHT 73.40 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	1.10 KM	1.20 KM	1.30 KM	1.40 KM	1.50 KM	1.60 KM	1.70 KM	1.80 KM
ANGLE	0.59 NM	0.64 NM	0.70 NM	0.75 NM	0.81 NM	0.86 NM	0.91 NM	0.97 NM
.0	-.60	-.31	-.06	.15	.33	.48	.62	.74
5.0	-1.33	-1.57	-1.14	-.36	.40	.94	1.18	1.10
10.0	-.85	.36	.50	-.81	.71	-.05	-.40	.75
15.0	-.24	.17	.38	.26	-.07	-.27	-.12	.18
20.0	.27	-.22	.33	-.26	.34	-.25	.31	-.18
25.0	.48	.05	-.36	.20	.36	-.20	-.16	.35
30.0	-.17	.33	.21	-.24	-.07	.31	.13	-.22
35.0	.34	-.22	.18	.09	-.13	.28	-.15	.14
40.0	.33	.17	-.27	.19	.23	-.21	.07	.31
45.0	.07	.29	.36	.26	.05	-.15	-.22	-.14
50.0	.23	-.26	.11	.32	-.19	-.03	.28	-.07
55.0	.10	-.21	.34	-.11	.01	.28	-.19	.16
60.0	.16	.36	.27	-.01	-.27	-.17	.08	.27
65.0	-.23	-.26	-.27	-.26	-.22	-.17	-.11	-.04
70.0	.25	.24	.24	.23	.23	.22	.22	.22
75.0	.40	.38	.35	.31	.28	.23	.18	.13
80.0	-.10	.12	.29	.35	.31	.18	-.03	-.14
85.0	.00	.36	.28	-.11	-.28	.03	.30	.21
90.0	.40	.01	-.24	.32	.08	-.23	.25	.12
95.0	.23	-.23	.36	-.29	.33	-.18	.19	.01
100.0	.10	.12	-.10	.27	-.28	.38	-.25	.30
105.0	.46	-.32	.22	.14	-.22	.34	-.12	.03
110.0	.34	.08	-.25	.37	-.08	-.09	.33	-.17
115.0	-.27	.14	.20	-.26	.40	-.18	.07	.23
120.0	.06	.01	.10	-.06	.19	-.11	.22	-.14
125.0	.34	.29	-.28	-.07	.37	.04	-.26	.12
130.0	-.15	-.04	.06	.15	.23	.28	.31	.33
135.0	-.39	.44	-.33	.38	-.27	.31	-.18	.23
140.0	.16	.26	.32	.36	.38	.41	.33	.28
145.0	-.26	-.24	.31	.31	-.24	-.20	.25	.28
150.0	.37	.01	-.17	.39	-.27	.19	.14	-.21
155.0	-.25	.45	-.20	.01	.33	-.28	.20	.15
160.0	-.39	-.04	.35	.39	.01	-.26	-.20	.13
165.0	-.39	-.19	.24	.41	.17	-.20	-.25	.04
170.0	-.36	.29	.32	-.26	-.10	.36	.09	-.27
175.0	-.29	.27	-.03	.01	.21	-.26	.33	-.27
180.0	-.31	.05	.37	-.33	.18	.23	-.29	.27

PATTERN DEGRADATION IN (DB)

FREQUENCY 133.740 MHZ DRILL TOWER HEIGHT 73.400 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	1.10 KM	1.20 KM	1.30 KM	1.40 KM	1.50 KM	1.60 KM	1.70 KM	1.80 KM
ANGLE	0.59 NM	0.64 NM	0.70 NM	0.75 NM	0.81 NM	0.86 NM	0.91 NM	0.97 NM
.0	-2.11	-2.10	-1.98	-1.81	-1.60	-1.39	-1.19	-.99
5.0	.21	-1.19	-1.17	.15	1.08	1.01	.04	-1.03
10.0	-.25	.07	.27	-.19	.02	.26	-.13	-.02
15.0	-.40	.41	-.27	.30	-.15	.19	-.04	.08
20.0	.12	.28	-.20	.01	.27	-.10	-.08	.25
25.0	-.21	-.34	-.02	.31	.33	.02	-.24	-.18
30.0	.29	.21	.17	.12	.08	.04	.01	-.03
35.0	-.15	-.02	.11	.22	.29	.31	.31	.23
40.0	-.28	.29	-.15	.09	.10	-.11	.25	-.20
45.0	.20	.07	-.05	-.16	-.22	-.24	-.21	-.14
50.0	-.30	-.27	-.18	-.06	.06	.16	.24	.27
55.0	.03	-.01	-.05	-.09	-.12	-.14	-.16	-.18
60.0	.22	-.29	.06	.32	-.15	-.10	.33	.00
65.0	.36	-.12	-.30	.15	.32	-.06	-.23	.10
70.0	-.04	-.22	.37	-.09	-.08	.33	-.16	.00
75.0	.35	.39	.38	.32	.23	.11	.00	-.11
80.0	-.36	-.22	.08	.32	.35	.18	-.08	-.24
85.0	.11	-.35	.13	.35	-.15	-.19	.29	.16
90.0	-.24	.42	-.28	.17	.16	-.24	.34	-.17
95.0	.43	-.35	.40	-.31	.36	-.28	.34	-.25
100.0	.02	-.26	.41	-.12	-.10	.36	-.21	.04
105.0	.39	.41	.13	-.21	-.32	-.10	.21	.35
110.0	-.30	-.37	-.13	.18	.37	.34	.13	-.13
115.0	.47	-.38	.40	-.31	.27	-.10	.11	.02
120.0	.32	.11	-.11	-.28	-.34	-.29	-.20	.03
125.0	.36	.44	.07	-.33	-.21	.22	.39	.10
130.0	-.07	.46	-.01	-.34	.25	.28	-.26	-.04
135.0	.26	-.16	-.39	-.23	.18	.38	.33	.01
140.0	.49	.16	-.34	-.21	.29	.36	-.06	-.31
145.0	.51	.31	-.13	-.35	-.28	.05	.33	.36
150.0	.45	.26	-.33	-.15	.35	.28	-.23	-.20
155.0	-.26	-.15	-.04	.07	.16	.24	.30	.34
160.0	.50	-.42	.45	-.35	.37	-.24	.26	-.11
165.0	.23	-.44	.16	.38	-.27	-.09	.40	-.05
170.0	.48	-.34	.33	-.14	.09	.07	-.07	.24
175.0	-.30	-.16	-.03	.11	.22	.30	.36	.38
180.0	-.45	-.10	.41	.32	-.20	-.31	.15	.39

PATTERN DEGRADATION IN (DB)

FREQUENCY 138.780 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	1.10 KM	1.20 KM	1.30 KM	1.40 KM	1.50 KM	1.60 KM	1.70 KM	1.80 KM
ANGLE	0.59 NM	0.64 NM	0.70 NM	0.75 NM	0.81 NM	0.86 NM	0.91 NM	0.97 NM
.0	-2.04	-2.10	-2.03	-1.89	-1.70	-1.50	-1.31	-1.11
5.0	-.40	-1.43	-.59	.73	1.17	.52	-.70	-1.09
10.0	.14	-.28	.14	.27	-.18	-.04	.28	-.02
15.0	.18	.16	-.28	.46	-.41	.39	-.16	.07
20.0	.02	.32	.19	-.15	-.19	.12	.28	.09
25.0	.39	-.21	-.05	.36	-.18	-.03	.31	-.16
30.0	.01	-.26	-.12	.21	.29	.04	-.20	-.10
35.0	.31	.01	-.16	.33	-.15	.01	.25	-.21
40.0	-.10	-.28	-.09	.21	.32	.14	-.15	-.19
45.0	-.29	.36	-.26	.27	-.12	.12	.08	-.07
50.0	.36	-.29	.35	-.26	.30	-.20	.24	-.13
55.0	.39	-.08	-.24	.23	.24	-.18	-.09	.27
60.0	.18	-.10	-.28	-.23	-.01	.25	.31	.23
65.0	-.20	.34	.13	-.29	.11	.30	-.13	-.13
70.0	.21	-.22	.35	-.31	.33	-.20	.19	-.01
75.0	-.13	-.23	.33	.14	-.29	.12	.29	-.17
80.0	-.36	-.03	.37	.18	-.25	-.14	.27	.25
85.0	-.12	-.33	.14	.38	.02	-.29	.06	.33
90.0	-.39	.10	.39	-.08	-.27	.23	.27	-.19
95.0	-.10	.42	-.06	-.26	.32	.14	-.28	.15
100.0	-.36	.29	.24	-.32	.09	.33	-.20	-.05
105.0	.05	.45	.03	-.34	.00	.37	.10	-.28
110.0	.44	.43	.29	.08	-.13	-.28	-.30	-.20
115.0	.27	-.18	-.37	-.15	.28	.37	.17	-.21
120.0	.38	-.40	.37	-.10	-.03	.30	-.32	.34
125.0	-.40	.09	.43	.28	-.15	-.36	-.03	.31
130.0	-.41	-.38	-.35	-.31	-.28	-.24	-.22	-.19
135.0	.24	.26	.24	.26	.27	.30	.31	.30
140.0	.42	.20	-.39	.08	.40	-.14	-.23	.31
145.0	.47	.14	-.34	-.35	.06	.39	.35	-.01
150.0	.33	.22	-.40	.35	.17	-.33	.31	.09
155.0	-.03	-.42	-.12	.40	.36	-.09	-.33	-.02
160.0	.14	.47	-.03	-.38	.11	.41	-.01	-.35
165.0	-.44	-.43	-.40	-.34	-.28	-.20	-.12	-.04
170.0	.39	.47	.17	-.24	-.36	-.10	.24	.39
175.0	.46	.01	-.26	.45	-.21	-.01	.34	-.31
180.0	.25	-.26	.40	-.37	.43	-.35	.37	-.23

PATTERN DEGRADATION IN (DB)

FREQUENCY 140.800 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	1.10 KM	1.20 KM	1.30 KM	1.40 KM	1.50 KM	1.60 KM	1.70 KM	1.80 KM
ANGLE	0.59 NM	0.64 NM	0.70 NM	0.75 NM	0.81 NM	0.86 NM	0.91 NM	0.97 NM
.0	-2.01	-2.09	-2.04	-1.91	-1.74	-1.55	-1.35	-1.16
5.0	-.65	-1.41	-.31	.91	1.11	.24	-.94	-.91
10.0	.32	-.21	-.11	.32	.05	-.23	.17	.22
15.0	-.49	.48	-.20	.02	.31	-.37	.40	-.17
20.0	-.05	-.27	-.15	.14	.30	.20	-.06	-.22
25.0	.02	.26	-.29	.32	-.11	.01	.23	-.25
30.0	.01	-.26	.21	.23	-.23	-.01	.29	-.03
35.0	.03	.04	.06	.01	.09	-.02	.10	-.03
40.0	-.27	-.27	-.21	-.19	-.16	-.13	-.11	-.08
45.0	-.15	-.23	.20	.29	-.10	-.20	.15	.26
50.0	-.18	-.25	.16	.33	.02	-.24	-.05	.27
55.0	.20	.15	.10	.15	.00	-.04	-.08	-.15
60.0	.38	-.29	.32	-.22	.29	-.15	.19	-.08
65.0	-.01	.22	.35	.33	.17	-.04	-.20	-.23
70.0	.26	.37	.36	.23	.04	-.14	-.24	-.23
75.0	.38	.02	-.30	-.16	.21	.33	.09	-.21
80.0	.01	-.33	-.17	.23	.35	.09	-.23	-.19
85.0	.10	.35	.39	.22	-.04	-.25	-.26	-.08
90.0	.39	.41	.40	.38	.34	.29	.23	.17
95.0	.40	.42	.39	.33	.24	.13	.01	-.10
100.0	-.36	-.33	-.11	.16	.34	.36	.22	-.01
105.0	-.06	-.30	-.35	-.16	.08	.29	.36	.27
110.0	.34	.28	.19	.16	.09	.03	-.02	-.08
115.0	-.27	-.35	.06	.39	.29	-.10	-.31	-.07
120.0	-.41	.40	-.22	.18	.04	-.07	.25	-.24
125.0	-.24	.02	.26	.39	.43	.28	.09	-.11
130.0	.48	.28	-.10	-.36	-.25	.08	.34	.34
135.0	.35	-.10	-.39	-.19	.22	.40	.21	-.20
140.0	-.43	-.41	-.25	-.11	-.01	.17	.26	.34
145.0	.31	-.04	-.04	.28	-.30	.40	-.32	.31
150.0	.49	-.27	.01	.37	-.35	.21	.18	-.34
155.0	.03	-.01	.18	-.15	.29	-.25	.39	-.30
160.0	.47	.47	.33	.10	-.14	-.31	-.33	-.22
165.0	-.43	.15	.35	-.36	.10	.35	-.30	.06
170.0	.24	-.33	-.29	.24	.42	.02	-.34	-.08
175.0	.48	.19	-.39	-.08	.41	.17	-.32	-.07
180.0	.50	.45	.32	.15	-.04	-.20	-.30	-.33

Appendix C: Numerical Results - UHF Data

PATTERN DEGRADATION IN (DB)

FREQUENCY 250.900 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-9.23	-5.32	-3.98	.86	-1.80	-.28	1.33	1.88
5.0	-2.96	-.81	-.50	-.34	-.20	.18	-.01	-.08
10.0	.97	.43	-.21	-.33	.11	-.12	-.09	-.03
15.0	-.09	-.06	.02	.13	-.09	-.08	-.07	-.07
20.0	1.05	.53	.24	-.06	.02	-.04	-.07	-.06
25.0	-.56	.07	.01	.06	.12	.17	-.05	-.01
30.0	-.05	.18	-.34	.32	.15	-.10	.08	-.04
35.0	.08	.50	-.37	.15	.12	.10	.00	-.01
40.0	.15	-.42	.34	.18	-.15	.04	-.06	-.04
45.0	-.04	-.11	.11	.00	.16	.14	-.06	.07
50.0	.16	.28	-.41	.20	.20	.17	.05	-.03
55.0	-.76	-.45	-.30	-.13	-.22	-.02	.04	-.02
60.0	-.79	.28	-.24	.24	-.08	.06	.11	.07
65.0	-1.18	-.34	-.10	.04	-.26	.13	.00	-.05
70.0	.64	.58	.31	-.14	.28	-.05	.12	-.02
75.0	-1.13	-.59	-.47	-.30	.23	-.16	-.03	.08
80.0	.41	-.46	.48	-.38	.24	.02	-.08	.08
85.0	.98	.11	-.42	-.35	-.27	-.17	-.04	.03
90.0	1.11	.57	.38	.17	.24	.17	-.10	.04
95.0	1.18	.63	.43	.20	-.12	-.11	.03	.05
100.0	1.23	-.52	.00	.37	.19	-.14	-.10	-.07
105.0	.66	.40	.42	.38	-.30	-.18	-.11	-.05
110.0	-1.45	-.64	-.31	-.09	-.29	-.03	-.04	.10
115.0	1.29	.41	-.23	-.44	.27	-.03	-.02	.08
120.0	.16	.38	-.53	.45	-.24	.18	-.10	.10
125.0	.66	.06	-.20	-.32	-.13	.09	.14	.02
130.0	.31	.20	-.31	.37	.34	-.06	.08	-.05
135.0	1.32	-.69	.36	.04	-.32	.12	-.08	-.07
140.0	.00	.52	-.63	.42	.33	.23	.13	.07
145.0	1.36	.09	-.65	.11	-.10	-.16	-.12	-.06
150.0	.75	-.36	.33	-.20	.35	-.17	.05	.11
155.0	1.20	-.13	-.25	.44	-.18	.15	.07	-.10
160.0	.50	.29	.20	.13	.24	.11	.02	-.05
165.0	1.24	-.80	.55	-.21	.36	-.19	.05	.13
170.0	-1.50	.23	.52	-.41	-.34	-.01	.08	-.07
175.0	-1.00	-.72	.03	.44	-.32	.12	-.08	.11
180.0	-.57	.40	.63	.41	.32	-.21	.11	.08

PATTERN DEGRADATION IN (DB)

FREQUENCY 251.400 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-9.27	-5.38	-4.00	.86	-1.80	-.29	1.33	1.88
5.0	-2.98	-.81	-.50	-.34	-.18	.18	.03	-.08
10.0	.96	.44	-.17	-.33	.04	-.02	-.03	-.05
15.0	-.11	.01	-.08	.22	-.20	-.13	.08	.05
20.0	1.04	.48	.10	-.23	.23	.14	-.07	-.02
25.0	-.63	.25	-.25	.29	-.23	-.10	.08	.06
30.0	-.17	.40	-.36	.02	-.18	-.02	-.03	.09
35.0	.23	.28	-.27	.25	.04	.16	-.03	-.02
40.0	.35	-.50	-.29	.08	-.18	.04	-.08	-.01
45.0	-.31	.44	-.41	.08	.13	.16	-.08	.08
50.0	-.18	.51	.36	.03	-.04	-.09	-.07	.04
55.0	-.37	.40	.35	-.24	.25	.12	-.08	.05
60.0	-1.10	.34	.41	-.09	.27	-.15	-.02	.06
65.0	-1.12	-.05	.47	.15	-.17	-.03	-.08	.06
70.0	1.03	-.45	.40	-.30	.15	-.05	.02	.05
75.0	-1.20	.56	-.34	.17	-.15	-.13	-.08	.00
80.0	-.53	.38	.48	.31	.18	.01	-.08	-.06
85.0	.17	.33	-.51	.35	-.25	-.18	-.10	-.07
90.0	.34	-.02	-.10	.25	-.25	-.17	.09	.04
95.0	.40	-.33	.38	-.29	-.05	-.15	.01	.09
100.0	.74	-.47	-.42	.28	.30	-.17	.04	.10
105.0	1.24	-.33	-.25	.43	-.22	.12	-.03	.04
110.0	-.11	-.21	.46	-.44	.26	-.10	.04	.03
115.0	.31	.60	.58	.26	.16	.03	-.05	-.07
120.0	-1.48	.28	.36	-.45	-.21	.19	-.10	.10
125.0	-1.31	-.08	.43	.46	-.30	-.09	.13	.03
130.0	1.31	-.16	-.53	.23	-.30	-.13	.13	-.08
135.0	.25	-.30	.43	-.40	.25	.07	-.08	-.09
140.0	1.34	-.17	-.53	.28	.15	-.01	-.09	-.10
145.0	-.48	.73	-.51	.07	.00	-.01	.01	.02
150.0	1.07	-.73	.63	-.41	.06	.12	.13	-.03
155.0	-1.10	.73	-.64	.41	-.13	.14	.05	-.08
160.0	1.18	.68	.62	.48	-.29	.00	.13	-.08
165.0	.35	.31	-.39	.44	-.35	-.08	.17	-.05
170.0	.22	.65	-.53	-.08	.25	.25	-.08	-.03
175.0	-.49	.58	.60	.07	.12	.17	.15	.08
180.0	1.38	.50	-.07	-.40	-.31	.17	-.13	.07

PATTERN DEGRADATION IN (DB)

FREQUENCY 273.000 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-8.89	-5.90	-4.84	.67	-1.59	-.52	1.21	1.80
5.0	-3.13	-.73	-.42	-.29	.21	.14	.04	-.02
10.0	.78	.20	-.12	-.26	-.02	.13	-.01	-.04
15.0	-.85	-.41	.22	.18	.10	.04	-.03	-.06
20.0	-.18	-.27	.29	-.27	-.19	-.01	.09	-.04
25.0	.53	-.18	.29	-.27	.04	-.10	-.03	.07
30.0	.87	-.46	.33	-.12	-.10	-.08	-.04	-.03
35.0	.43	.35	-.40	.22	-.20	.12	-.04	-.04
40.0	.41	.48	.31	.05	.10	.12	.08	.00
45.0	.81	.49	.42	.32	-.06	.12	.09	.05
50.0	-1.06	.51	-.39	.24	-.18	.15	.08	.00
55.0	-.61	.05	.08	-.10	.25	-.12	.07	.06
60.0	-.77	.37	-.12	-.03	-.21	.07	-.09	-.01
65.0	.12	.44	-.36	-.15	.22	-.10	.01	.06
70.0	.58	.35	-.43	-.12	-.27	.10	-.10	.02
75.0	-.65	.08	.10	-.15	-.19	-.17	.00	.09
80.0	-.14	-.50	.35	.26	-.18	-.09	-.05	-.04
85.0	.29	-.60	.43	.00	-.29	.19	.11	.07
90.0	.47	.57	.42	-.04	.27	.13	-.06	.05
95.0	-1.02	-.35	-.24	-.12	-.08	-.01	.01	.02
100.0	1.16	-.68	.37	.00	-.31	.22	.12	.09
105.0	-1.01	.04	.41	.44	-.12	.19	.05	-.08
110.0	-.58	-.04	.42	-.45	-.29	-.05	.13	-.06
115.0	-.04	-.37	.57	-.37	.29	.22	.12	.06
120.0	-1.49	-.08	.56	.20	.04	-.14	-.10	.05
125.0	1.30	.43	-.08	-.41	-.33	-.17	.07	.10
130.0	1.24	.41	-.43	-.36	-.22	-.04	.07	.11
135.0	-.16	.62	-.56	.07	-.12	-.15	-.12	-.01
140.0	1.16	-.47	.28	-.01	-.34	.17	-.02	-.08
145.0	-1.34	-.69	-.64	-.48	.33	.12	-.13	.01
150.0	-.25	-.75	.00	.48	-.04	.04	.05	.08
155.0	.06	.70	.29	-.43	-.34	-.16	.09	.09
160.0	.55	.55	.62	.38	.01	.19	.00	-.07
165.0	-1.62	-.61	-.35	-.13	.33	-.16	-.03	.02
170.0	.72	-.65	-.41	.29	-.08	.19	.04	-.10
175.0	.69	-.74	.43	.19	.35	-.22	-.02	.09
180.0	-1.62	.61	-.07	-.33	.29	-.17	-.12	-.10

PATTERN DEGRADATION IN (DB)

FREQUENCY 277.100 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-9.55	-5.54	-4.88	.61	-1.54	-.56	1.20	1.78
5.0	-3.35	-.73	-.42	-.26	.17	.10	.03	-.01
10.0	.80	.04	-.34	-.20	-.10	-.01	.07	.06
15.0	-.94	-.04	.22	-.25	.19	.14	.09	.07
20.0	-.49	.42	-.25	-.14	.19	-.13	-.08	-.06
25.0	.83	.14	.00	-.06	-.07	-.13	.07	-.01
30.0	.49	.17	-.16	-.28	-.03	.13	.00	-.05
35.0	.90	.45	.19	-.08	-.21	.01	-.06	.07
40.0	-.95	.11	.38	.27	.12	-.10	-.06	-.05
45.0	-.92	-.48	-.02	.29	-.13	.14	.09	.05
50.0	.85	.36	.35	.29	.19	-.13	.08	.03
55.0	.69	.50	.06	-.32	-.19	.11	-.08	.08
60.0	.25	.13	-.38	.36	.10	-.18	.10	-.03
65.0	.99	.53	.45	.27	.09	.12	.06	-.07
70.0	1.06	-.34	.13	.10	-.20	-.04	-.08	.07
75.0	-.02	-.09	.11	-.07	.12	.19	.02	-.07
80.0	.04	.27	.47	.38	.21	-.19	-.07	.05
85.0	-.74	-.54	-.53	-.28	-.20	.11	.06	.04
90.0	1.11	-.10	-.50	.21	.20	-.02	.11	.05
95.0	.16	.35	-.41	.41	.26	-.14	.11	-.08
100.0	-1.18	.30	.03	-.21	-.31	.19	-.06	-.08
105.0	1.22	.65	.54	.39	-.23	-.10	.04	.09
110.0	-.88	-.67	-.50	-.11	.22	.21	.00	-.09
115.0	-1.42	.65	-.54	.38	.20	-.06	-.11	.05
120.0	-1.29	-.37	-.05	.20	-.19	-.21	-.08	.03
125.0	1.29	-.20	-.38	.45	-.29	-.10	.05	.10
130.0	.82	-.27	.21	-.11	.21	.22	.01	-.09
135.0	1.11	.03	-.46	.46	.21	-.16	.08	-.01
140.0	.81	.49	-.53	-.03	-.21	-.11	.04	.00
145.0	1.16	-.39	.12	.21	-.21	-.22	-.06	.06
150.0	1.16	-.72	.60	-.34	.20	-.08	.05	.09
155.0	-.34	-.25	.53	-.50	-.35	-.23	-.13	-.09
160.0	-.47	-.69	-.55	.02	.25	.16	-.04	.03
165.0	1.35	.36	-.19	-.45	-.34	.05	.03	-.04
170.0	-.12	.56	-.65	.23	-.28	-.23	.04	.10
175.0	.06	-.14	.23	-.18	-.30	-.20	.14	-.05
180.0	1.25	-.28	.01	.22	-.32	-.15	.13	-.12

PATTERN DEGRADATION IN (DB)

FREQUENCY 277.900 MHZ DRILL TOWER HEIGHT 73.400 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-9.60	-5.46	-4.88	.60	-1.54	-.57	1.19	1.77
.5.0	-3.39	-.74	-.42	-.25	.16	.07	-.01	-.05
10.0	.81	.00	-.37	-.15	.00	.11	.02	-.06
15.0	-.97	.05	.11	-.14	.01	-.10	.00	.06
20.0	-.55	.45	-.02	-.29	-.15	.07	.03	-.06
25.0	.87	.35	.32	.28	.06	-.13	.06	-.01
30.0	.36	-.23	-.36	.10	.22	-.09	.07	.05
35.0	.85	.05	-.40	.05	-.18	-.06	.01	.02
40.0	-1.01	-.47	-.42	-.32	-.17	.12	-.07	.07
45.0	-1.04	.29	-.04	-.10	.08	.07	.03	.02
50.0	.96	.05	-.42	.23	.24	.04	-.01	.01
55.0	.96	-.50	.44	-.28	.16	-.15	-.09	-.03
60.0	-.54	-.15	-.19	-.19	.13	.04	-.01	-.03
65.0	.92	-.53	.34	-.18	.21	-.02	.07	.09
70.0	.76	.53	.45	.36	.22	-.01	-.11	.05
75.0	-1.13	-.58	-.43	-.17	-.02	.08	.12	.00
80.0	1.05	-.22	-.51	.04	.02	.02	.00	-.03
85.0	-1.09	-.41	.14	.36	.05	-.17	-.03	.09
90.0	-.26	-.30	-.46	-.42	-.28	-.13	-.01	.05
95.0	1.17	-.20	-.39	.38	-.10	.07	.00	-.05
100.0	-.24	.59	-.49	.08	-.05	-.18	-.06	.07
105.0	-.20	-.22	-.39	-.39	-.11	.19	-.07	.03
110.0	-.33	.47	.52	.00	-.06	-.03	-.07	-.08
115.0	1.12	-.70	.49	-.13	-.28	.14	.02	-.02
120.0	.49	.58	.56	.26	-.23	-.21	-.08	.03
125.0	-.96	.65	-.59	.34	.10	.18	.01	-.10
130.0	-1.37	-.57	.07	.44	.26	-.22	.04	.10
135.0	-.53	.64	.12	-.49	.31	.08	-.11	-.05
140.0	-1.18	-.12	.34	.42	.34	.12	-.13	.02
145.0	-.94	.00	.41	.48	-.14	.20	.10	-.07
150.0	-1.43	-.74	-.55	-.20	.30	-.20	-.10	-.06
155.0	.73	-.27	-.60	-.49	-.20	.14	.04	-.08
160.0	.76	-.59	.62	-.39	-.35	-.23	-.05	.10
165.0	-1.59	.03	.55	-.32	.35	-.03	.08	-.08
170.0	.39	.26	.39	.43	.34	-.11	.11	-.09
175.0	.20	-.53	-.61	-.39	.34	.15	-.13	.02
180.0	-1.37	.14	.60	.37	.32	.23	.00	-.11

PATTERN DEGRADATION IN (DB)

FREQUENCY 283.400 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-9.11	-4.89	-4.86	.50	-1.46	-.63	1.17	1.76
5.0	-3.50	-.75	-.40	-.20	.01	-.14	.04	.03
10.0	.82	-.27	-.30	.27	-.02	.15	-.08	.05
15.0	-1.15	.48	-.29	.00	-.21	.10	-.02	-.06
20.0	-.94	-.38	-.39	-.28	-.20	-.13	-.07	-.04
25.0	.84	-.49	.36	-.23	.10	-.04	-.08	.05
30.0	-.72	-.02	.06	.11	.13	.11	-.02	-.02
35.0	-.39	-.48	.04	.31	.22	.12	-.02	-.06
40.0	.62	.39	-.36	-.01	.19	.04	.06	-.07
45.0	.90	.41	.40	.33	.16	-.13	.08	-.05
50.0	-.98	.07	.41	-.14	.24	-.08	.09	.01
55.0	-.63	-.52	-.34	-.08	-.20	-.14	.10	-.07
60.0	.66	.34	-.30	-.30	.24	-.10	.12	-.04
65.0	1.02	-.24	-.40	.27	.24	-.17	.03	.09
70.0	.32	-.02	-.19	.30	.23	.15	.10	.06
75.0	-.53	.16	.48	.23	.08	.16	-.03	-.02
80.0	-.40	-.46	.46	.00	-.25	-.01	-.11	.08
85.0	.94	.52	.14	-.26	-.26	-.16	.09	.07
90.0	1.14	-.62	.44	-.21	.29	-.15	.11	.05
95.0	.77	.45	-.48	-.11	-.26	.08	-.06	-.09
100.0	-.42	-.65	-.22	.30	-.21	-.20	-.13	-.03
105.0	-1.18	-.46	-.36	-.21	-.13	-.02	.02	.05
110.0	1.24	-.65	.42	-.17	-.14	-.18	.09	-.03
115.0	-.38	-.04	.29	-.34	-.29	.20	-.09	-.02
120.0	-.79	-.09	.41	-.44	-.33	-.18	-.05	.01
125.0	1.24	-.22	-.57	.15	-.16	-.15	-.13	-.06
130.0	-.97	.01	.41	.47	.33	.18	-.03	-.11
135.0	.18	-.47	-.63	-.40	-.22	.15	.12	.12
140.0	-1.00	-.71	-.21	.34	-.26	-.22	-.13	-.06
145.0	-1.60	-.54	-.12	.25	.22	.08	.12	-.06
150.0	.28	.67	.33	-.25	-.17	-.06	.00	.01
155.0	-1.54	.59	-.17	-.14	-.25	-.23	.02	.11
160.0	-1.65	-.55	-.19	.05	-.31	-.14	.08	-.04
165.0	1.21	-.70	.61	-.51	.31	.01	-.16	.04
170.0	-.97	-.72	-.56	-.06	-.33	.19	.04	-.05
175.0	-.57	.29	.54	.50	.33	.16	-.03	-.10
180.0	1.40	.11	-.57	-.43	.04	-.24	.14	-.08

PATTERN DEGRADATION IN (DB)

FREQUENCY 300.500 MHZ DRILL TOWER HEIGHT 73.400 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-9.47	-3.35	-4.37	.14	-1.22	-.80	1.07	1.70
5.0	-3.66	-.80	-.21	.20	-.24	.03	-.15	-.01
10.0	.63	-.51	.28	-.09	.26	-.14	-.03	.04
15.0	-1.25	-.31	.35	.29	-.02	-.18	.05	.02
20.0	-.53	-.27	.07	.27	-.12	.04	.10	.03
25.0	-1.07	-.50	-.19	.15	-.02	-.15	.03	.04
30.0	.91	.27	-.33	-.15	.22	-.15	-.04	.04
35.0	.54	-.40	.09	.21	-.19	.13	.08	.04
40.0	.89	.19	-.40	.19	-.16	-.09	-.06	-.06
45.0	-.62	-.20	-.31	-.31	.22	.08	-.09	.04
50.0	-.32	-.39	.41	-.29	-.24	-.16	.00	.07
55.0	.11	.36	.35	-.11	-.01	-.16	-.02	.07
60.0	-.59	.42	.00	-.34	.01	.14	.03	-.08
65.0	1.02	-.55	.38	-.15	-.24	.13	.06	.04
70.0	-1.11	-.30	.15	.37	-.25	-.14	-.01	.04
75.0	-1.28	-.06	.29	.39	.24	.01	-.13	.02
80.0	-1.10	.54	-.51	.38	-.02	.08	.12	.01
85.0	.76	-.08	.07	.02	.02	.05	.04	.03
90.0	.55	.29	-.53	.11	-.27	-.02	-.03	.05
95.0	-1.37	-.50	-.21	.13	.27	-.11	.01	.07
100.0	.86	-.06	-.31	-.41	.29	.04	-.12	.07
105.0	1.23	-.62	.48	-.41	-.25	.19	.11	.00
110.0	1.21	-.61	.37	-.20	.19	.06	.14	-.04
115.0	.81	-.53	-.44	.27	.19	.20	.12	.06
120.0	-.47	-.36	-.49	-.46	.32	.21	.03	-.06
125.0	-1.38	-.58	.11	.41	.05	.05	.12	.08
130.0	1.07	.53	.47	.43	-.02	.21	-.05	-.06
135.0	-.78	-.31	.57	-.23	-.35	-.05	.00	.02
140.0	1.33	.52	.29	.13	-.31	.11	-.07	-.11
145.0	.56	.16	-.03	-.06	-.02	-.20	-.09	.06
150.0	.08	.47	.58	.36	-.34	-.17	.12	.03
155.0	-.83	.53	.39	-.31	.14	.01	.13	.02
160.0	1.16	.33	-.57	-.10	.34	-.24	-.13	-.06
165.0	-1.54	-.55	.15	.45	-.36	-.19	.08	.07
170.0	-.05	.50	.59	.16	-.09	-.01	.03	.04
175.0	-1.09	-.44	.54	.24	.28	.16	-.15	.07
180.0	.04	.38	-.55	.50	-.11	.18	.14	.07

PATTERN DEGRADATION IN (DB)

FREQUENCY 312.700 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-8.84	-2.90	-3.82	-.17	-1.04	-.91	1.01	1.66
5.0	-3.71	-.76	.12	.51	.30	.12	-.07	-.14
10.0	.32	.36	-.57	-.13	.22	.10	.04	-.12
15.0	-.65	.29	.20	-.41	.27	.17	.01	-.09
20.0	.61	-.47	-.39	-.05	.11	.15	-.09	.02
25.0	.12	.40	.01	-.31	-.02	-.06	-.08	-.07
30.0	-.79	.14	.28	.29	-.02	.04	.04	.03
35.0	.03	.12	.08	-.18	.20	.02	.00	-.03
40.0	.04	.21	.37	.10	.03	-.02	-.07	-.07
45.0	-.69	.36	-.41	.19	-.11	-.11	-.06	-.04
50.0	-1.02	.10	.40	-.04	-.11	-.17	.05	.01
55.0	-.08	-.46	.41	-.34	.07	-.01	.06	.07
60.0	-1.12	.16	.00	-.17	.07	.01	-.06	-.08
65.0	1.04	-.42	-.06	.32	.14	-.14	-.10	-.08
70.0	1.08	.07	-.26	-.41	.12	-.16	-.07	.05
75.0	.46	.51	.44	.24	.25	.14	-.12	.03
80.0	-.80	.42	-.13	-.01	.11	.18	-.02	-.11
85.0	.24	.17	-.48	.39	.09	-.20	.10	-.07
90.0	1.05	.03	-.24	-.43	-.23	-.07	.09	.06
95.0	-1.07	-.06	.44	.38	.28	.18	.02	-.06
100.0	.07	-.64	-.14	.40	.23	-.20	.07	.08
105.0	.36	-.42	-.54	-.42	-.30	-.21	-.14	-.09
110.0	1.00	.60	.51	.32	-.15	-.01	-.13	-.06
115.0	.42	-.31	-.58	-.33	-.34	.04	-.06	.05
120.0	1.35	-.30	-.14	.44	-.21	.04	.10	-.12
125.0	-1.16	.04	.29	-.51	.21	-.23	.05	.08
130.0	-.89	-.51	-.57	-.52	.32	.22	.12	.06
135.0	.81	.65	.24	-.27	.31	.14	-.14	.09
140.0	.35	-.51	.56	-.39	-.11	.11	.08	-.11
145.0	1.06	-.44	-.46	.25	-.13	.02	.09	.09
150.0	1.00	.06	-.25	-.49	.31	-.15	.11	-.10
155.0	1.32	-.66	.55	-.51	.18	-.22	.11	-.07
160.0	-.32	.01	.10	.27	-.25	.01	-.13	-.12
165.0	1.39	.52	-.15	-.51	.33	.16	-.14	-.06
170.0	.97	.61	.57	.45	-.20	.13	.10	.09
175.0	1.46	-.43	-.17	.44	.31	-.10	.11	-.13
180.0	-1.19	.17	.54	.35	.34	.10	-.12	.09

PATTERN DEGRADATION IN (DB)

FREQUENCY 313.800 MHZ DRILL TOWER HEIGHT 73.400 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-8.69	-2.89	-3.77	-.20	-1.02	-.92	1.00	1.65
5.0	-3.69	-.75	.15	.53	.34	.19	.06	-.01
10.0	.28	.44	-.49	-.29	.02	.22	-.11	-.01
15.0	-.58	.13	.39	-.38	.02	-.19	.02	.07
20.0	.68	-.31	-.39	-.36	-.19	.08	-.06	.04
25.0	.26	.38	-.38	.20	.18	.12	-.05	-.06
30.0	-.91	-.32	-.34	-.31	-.06	.07	.06	.05
35.0	.33	-.44	.04	.28	-.05	.08	.07	-.01
40.0	.44	.26	-.31	.31	.19	-.07	.01	.01
45.0	-1.04	-.17	-.04	.07	.05	.13	.01	-.08
50.0	-.45	-.07	.30	.34	.20	-.05	-.04	.06
55.0	-.92	.17	.34	.35	-.10	.16	-.07	.01
60.0	-.86	-.53	-.46	-.39	.17	-.17	.10	-.08
65.0	.24	-.49	-.05	.37	-.18	.16	-.11	.06
70.0	.47	-.15	-.20	.32	-.19	.16	.09	.03
75.0	-1.15	.48	.23	-.41	-.18	.17	.03	-.08
80.0	1.00	-.21	.15	-.02	.05	.13	.10	.02
85.0	-1.34	.45	.01	-.31	.19	.09	.03	.03
90.0	.13	.23	.14	.15	.25	-.12	.01	.05
95.0	1.22	-.15	-.22	.42	.29	.13	-.07	-.10
100.0	-.76	.40	-.21	.14	-.12	-.14	-.12	-.10
105.0	.44	-.62	-.03	.45	-.20	.15	-.12	.08
110.0	-1.32	.61	-.38	.04	-.33	.17	.03	-.03
115.0	-.37	-.50	.41	.19	.26	.20	-.11	.00
120.0	-1.62	-.69	-.58	-.51	-.26	.00	.11	-.10
125.0	1.26	.63	.29	-.04	-.23	-.23	.12	-.06
130.0	1.24	.04	-.39	-.51	.32	.19	.00	-.10
135.0	-1.42	-.69	-.60	-.49	-.32	.13	-.11	.07
140.0	-1.14	.60	-.61	.47	-.26	-.05	.12	.03
145.0	.18	.65	.06	-.49	-.26	.17	-.15	.08
150.0	-1.74	-.70	-.56	-.36	-.31	.22	.06	-.05
155.0	-1.46	.31	.23	-.43	.07	-.25	.13	-.13
160.0	1.42	.63	.31	.05	-.33	.09	-.15	.01
165.0	-1.14	.68	-.17	-.42	-.29	.21	.13	.03
170.0	-1.71	.23	.52	-.20	.22	.21	.10	-.03
175.0	-.47	-.73	-.45	.18	-.18	-.22	-.13	-.03
180.0	1.35	.54	.35	.27	-.27	-.25	-.02	.09

PATTERN DEGRADATION IN (DB)

FREQUENCY 321.800 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-8.86	-2.99	-3.40	-.41	-.90	-.99	.96	1.63
5.0	-3.78	-.65	.41	.56	.31	-.05	-.17	.15
10.0	.09	.75	.39	-.03	.33	-.17	.10	.10
15.0	-.09	-.62	-.49	-.41	.26	.09	-.13	.01
20.0	.93	.01	-.24	.29	.03	.01	.04	.05
25.0	.85	.40	.20	-.09	.12	.12	-.01	-.07
30.0	-.15	-.11	.18	.28	.01	-.10	-.08	.02
35.0	.39	-.10	-.37	-.07	.11	.12	-.09	.07
40.0	-.51	-.47	.26	.14	-.09	-.16	.08	-.07
45.0	.71	-.18	-.30	.28	-.08	.13	-.07	.01
50.0	-1.13	-.40	-.38	-.33	.14	-.06	-.10	.02
55.0	-.89	-.42	.34	.11	.20	-.11	-.01	.03
60.0	.31	-.21	-.16	-.19	-.19	.00	-.10	-.07
65.0	-1.00	-.47	-.25	.02	.24	-.19	-.11	-.06
70.0	.17	-.54	-.42	-.08	-.26	.14	.01	-.05
75.0	.26	.18	-.49	.28	-.04	.12	.01	-.08
80.0	1.02	.48	.45	.33	.20	.13	.05	.01
85.0	.14	-.42	-.44	-.42	-.20	.17	-.12	.05
90.0	-.41	-.41	-.28	-.26	.26	.11	-.13	.06
95.0	-.83	-.34	.00	.16	.04	-.10	-.13	-.07
100.0	-1.43	-.55	-.33	-.07	.26	-.12	.08	.07
105.0	-.49	-.47	.51	-.25	-.30	.20	.09	.02
110.0	1.11	.61	.25	-.17	.17	.16	.12	.04
115.0	.31	-.15	-.49	-.51	-.32	-.16	.05	.08
120.0	.30	.15	-.01	-.05	-.25	-.20	.12	-.11
125.0	.86	-.70	-.03	.47	.29	.03	-.13	.08
130.0	1.38	.65	.54	.48	-.27	.14	-.08	.03
135.0	-.55	-.53	.42	.21	.01	.20	-.01	-.11
140.0	.51	-.72	.21	.35	-.33	.21	-.08	-.12
145.0	-.42	.56	.48	-.14	-.28	.04	-.15	-.04
150.0	.78	.63	.55	.30	.22	.14	.09	.08
155.0	-.93	.19	.46	.48	.09	-.09	-.08	-.07
160.0	.77	-.69	.51	-.23	.03	.21	.01	-.11
165.0	-1.62	-.55	-.18	.01	.33	-.24	-.13	-.09
170.0	-1.74	-.39	.27	.49	-.36	-.25	-.15	-.11
175.0	-.39	-.76	-.33	.33	.24	-.11	.00	.04
180.0	1.26	.53	.24	.14	.33	-.16	.11	.04

PATTERN DEGRADATION IN (DB)

FREQUENCY 336.200 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-9.56	-3.83	-2.83	-.79	-.67	-1.12	.89	1.58
5.0	-3.89	-.33	.78	.17	-.52	.33	.21	.12
10.0	-.50	-.01	-.36	-.53	-.39	-.27	-.09	.06
15.0	.63	.31	-.37	.32	.00	-.11	-.12	-.07
20.0	.51	-.11	-.33	.12	-.20	-.06	.00	-.02
25.0	-.21	-.27	.18	-.19	-.05	.06	.05	-.07
30.0	.20	.28	.11	-.02	-.24	.13	.07	.04
35.0	.74	-.41	-.35	.01	.19	-.11	.05	.03
40.0	-.11	.24	-.39	.05	-.21	-.06	-.01	-.01
45.0	-.39	-.13	.01	.00	.04	.10	.07	.01
50.0	.95	.49	.16	-.19	.19	.12	-.11	.02
55.0	.42	-.54	.38	-.34	-.20	.15	.04	-.05
60.0	.87	.52	.10	-.33	.17	-.19	-.10	-.04
65.0	.96	.18	-.43	-.21	.12	.10	.06	.04
70.0	-.96	.31	.10	-.41	-.26	.06	-.04	-.02
75.0	-1.16	-.24	.42	-.31	-.27	.15	-.07	-.09
80.0	-1.31	-.54	-.45	-.40	.18	-.21	-.06	.03
85.0	.10	.08	.33	.41	-.16	.17	.05	-.07
90.0	1.03	-.59	.31	-.07	-.08	-.20	-.07	.06
95.0	-1.28	.46	.33	-.39	.04	.14	.05	-.10
100.0	-.05	-.68	-.37	.14	-.24	-.07	-.12	.05
105.0	1.04	-.36	.31	-.27	.28	-.18	.06	.07
110.0	.92	-.24	.17	-.13	-.09	-.03	-.01	.00
115.0	-1.36	.45	.00	-.29	-.05	-.25	.12	-.12
120.0	1.18	-.71	.21	.19	.30	-.08	.10	-.10
125.0	1.03	.03	-.32	.43	-.09	.20	-.03	-.11
130.0	-1.01	.65	-.10	-.41	-.15	.00	-.12	-.11
135.0	-.72	-.50	.49	-.09	-.11	-.25	.03	.06
140.0	-.12	.43	.50	.28	-.17	-.11	-.02	.02
145.0	-1.64	-.81	-.60	-.55	-.30	-.05	.12	-.05
150.0	-1.48	-.40	.34	.44	-.34	.08	-.11	.08
155.0	1.30	-.07	-.43	.48	.03	-.18	-.12	.08
160.0	-1.52	.49	-.14	-.08	-.36	.22	.13	.10
165.0	-1.36	.25	.12	-.45	-.06	-.21	-.04	.09
170.0	-1.63	.21	.54	-.13	-.34	.02	-.13	.09
175.0	-.39	-.11	.40	-.53	.30	-.04	-.03	.02
180.0	1.15	.68	.32	-.19	-.30	-.12	.07	-.10

PATTERN DEGRADATION IN (DB)

FREQUENCY 340.400 MHZ DRILL TOWER HEIGHT 73.400 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-8.91	-4.22	-2.69	-.89	-.61	-1.15	.86	1.57
5.0	-3.77	-.21	.83	-.05	-.49	.09	-.27	.01
10.0	-.64	-.41	-.67	-.33	.26	-.20	-.14	-.11
15.0	.72	-.22	.31	-.36	.08	-.17	-.05	.06
20.0	.26	-.37	.23	-.21	.13	.10	.06	.02
25.0	-.77	.27	.31	.27	-.09	.12	-.09	.04
30.0	-.68	.26	-.39	.27	.05	-.15	.06	-.07
35.0	.72	-.46	.20	-.07	.18	-.04	.06	-.10
40.0	-.99	.37	.04	-.34	.17	-.10	.06	-.09
45.0	-.49	-.12	.34	.08	-.15	-.17	-.04	.05
50.0	-.88	.44	-.32	-.05	.13	.14	-.10	.01
55.0	-.22	.25	.34	-.15	-.26	.06	-.12	-.04
60.0	-1.15	-.13	.39	-.17	.22	-.19	-.08	-.03
65.0	.28	-.31	.40	-.22	-.01	-.16	-.02	.05
70.0	-1.07	-.55	-.43	-.20	.02	.16	-.09	.00
75.0	-.82	-.05	.12	-.25	.03	-.13	-.09	.06
80.0	-1.20	.55	-.45	.31	.12	-.07	.04	.07
85.0	1.01	.08	-.11	-.29	.18	.15	.10	.07
90.0	-.84	.50	-.50	.22	-.24	-.22	-.05	.06
95.0	.68	.53	-.40	-.13	.20	.16	-.13	.01
100.0	.11	.62	-.01	-.50	.19	-.14	.04	-.05
105.0	-1.46	-.04	.45	.25	.14	.05	.09	-.10
110.0	-1.09	-.24	.22	.41	-.01	-.12	-.15	-.04
115.0	-1.28	.65	-.53	.32	-.32	.19	-.05	-.11
120.0	1.01	.17	-.01	-.22	.19	.07	.09	-.10
125.0	1.23	.56	.48	.44	-.21	.19	.11	.03
130.0	-1.60	.62	-.27	.00	-.33	.13	-.10	-.10
135.0	-1.42	.64	-.54	.47	-.25	.21	-.11	-.02
140.0	1.32	-.63	.24	-.04	.31	-.25	-.16	-.11
145.0	1.00	-.77	.19	.28	-.30	-.26	-.04	.09
150.0	1.37	-.49	-.11	.40	-.16	.00	-.09	-.12
155.0	-1.55	.19	.32	-.57	.32	.21	.10	.03
160.0	1.15	.38	-.56	-.10	-.10	-.25	.00	.09
165.0	1.39	-.43	-.28	.50	.08	-.22	-.15	-.05
170.0	1.28	.41	-.07	-.32	.32	-.07	.10	-.12
175.0	-.61	-.20	-.11	.04	.14	.21	-.05	-.10
180.0	.01	.69	-.13	-.55	-.35	.01	.06	-.14

PATTERN DEGRADATION IN (DB)

FREQUENCY 361.800 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-9.90	-6.41	-2.31	-1.28	-.28	-1.32	.75	1.49
5.0	-3.70	.51	.56	-.91	.44	-.08	-.21	.20
10.0	-1.26	-.11	.15	-.19	.29	-.12	.13	-.11
15.0	.90	.23	-.33	.04	.12	.06	-.09	.02
20.0	-1.12	.26	.32	.05	-.24	.10	-.01	-.07
25.0	.71	-.30	-.38	-.35	-.24	-.12	.05	-.01
30.0	.64	-.45	.29	-.31	.13	-.16	.01	.03
35.0	.58	-.50	.28	-.25	-.19	.10	.05	.02
40.0	.80	-.53	.17	.18	.06	.07	-.01	-.08
45.0	-.94	-.23	-.25	-.26	.09	-.01	-.08	-.10
50.0	-.86	.07	.30	-.33	-.26	-.12	.07	-.09
55.0	-.67	-.43	.35	-.25	.20	.04	-.08	.01
60.0	-.51	-.53	-.41	-.37	.22	.03	-.13	.03
65.0	-1.09	-.37	-.36	-.38	.01	.02	.08	-.01
70.0	-.78	-.07	.38	.22	.04	-.12	-.11	.04
75.0	.71	-.43	-.13	.38	-.30	-.21	-.10	-.05
80.0	.91	.54	.24	-.21	-.27	.13	.03	-.02
85.0	.69	-.01	-.05	.07	.16	.09	-.04	-.08
90.0	.91	.36	.36	.39	.00	-.20	-.04	.06
95.0	1.10	-.68	.40	-.23	-.15	-.10	-.03	.01
100.0	1.13	.25	-.12	-.35	.27	.04	-.12	.07
105.0	.61	-.74	-.08	.44	.08	-.24	-.04	.07
110.0	-1.45	-.21	.22	.44	-.24	.05	.04	-.12
115.0	.71	.40	.41	.44	.10	-.25	.11	-.14
120.0	.70	.43	.47	.47	-.02	-.05	-.05	-.03
125.0	-1.14	.60	.12	-.55	-.35	-.21	.00	.07
130.0	-1.48	.22	.47	-.07	-.12	-.23	-.07	.07
135.0	1.24	.65	.49	.40	-.09	-.16	-.15	.00
140.0	.67	.20	-.48	.48	-.14	.19	.01	-.15
145.0	1.32	-.52	-.04	.35	-.10	.17	-.03	-.14
150.0	-1.63	.60	-.27	-.05	.00	.07	.08	.08
155.0	.57	-.52	-.57	-.10	-.16	-.27	.07	-.04
160.0	1.16	-.48	-.43	.38	.03	-.27	.10	-.11
165.0	.82	.65	-.21	-.56	.31	.20	-.02	-.13
170.0	-.99	.67	-.55	.23	-.37	.13	-.17	.01
175.0	-.41	-.74	.32	.34	.29	.19	-.13	-.07
180.0	.96	.04	-.36	-.55	.24	-.25	.10	-.02

PATTERN DEGRADATION IN (DB)

FREQUENCY 385.000 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-10.58	-5.79	-2.49	-1.38	.03	-1.48	.63	1.43
5.0	-3.39	1.11	-.62	.28	-.31	-.46	.26	-.28
10.0	-1.37	.34	.35	.07	-.10	-.10	-.10	-.10
15.0	.76	.43	.17	-.09	.18	-.20	-.14	-.10
20.0	.46	.32	.27	-.17	-.03	-.14	-.12	-.02
25.0	-.82	-.24	-.32	-.34	.02	-.17	-.06	.02
30.0	.73	-.31	.31	-.33	-.22	-.10	.03	.02
35.0	-.07	.05	-.36	.24	-.12	.00	-.02	-.03
40.0	-.89	-.40	-.41	-.24	.16	.11	-.04	-.10
45.0	-.56	.41	.20	-.17	.04	.11	-.11	.00
50.0	.89	-.49	.33	-.24	-.20	.04	-.02	-.04
55.0	.15	-.41	-.28	.29	-.27	-.04	-.02	-.05
60.0	.89	-.53	.14	.11	.16	.11	-.14	.04
65.0	-1.00	-.09	.21	-.36	.19	.15	.06	.02
70.0	.47	-.56	.38	-.45	-.30	-.23	-.13	-.10
75.0	-.36	-.05	-.12	.17	-.19	-.13	-.10	.06
80.0	-.35	.50	-.21	-.24	.15	-.11	.03	.05
85.0	-.22	.36	-.51	.03	-.32	.14	-.04	-.13
90.0	1.12	.34	-.41	-.27	.16	-.11	.02	.06
95.0	-.55	-.66	-.11	.31	-.03	-.25	.07	-.07
100.0	-.53	-.62	-.50	-.06	.24	-.19	-.06	.02
105.0	.59	-.08	-.18	-.21	-.08	-.25	.04	-.06
110.0	1.07	.54	.39	.30	-.32	-.25	-.04	.06
115.0	1.20	.52	.22	-.04	.07	.15	.10	-.05
120.0	-1.04	-.72	-.43	-.10	-.30	-.04	-.17	.04
125.0	-.06	.61	.20	-.51	-.05	.14	.06	-.14
130.0	-.48	.23	.40	.46	-.12	.16	.07	-.06
135.0	-.27	.63	-.37	-.30	-.26	.02	-.16	-.11
140.0	-1.26	.66	-.46	.07	-.01	-.08	-.10	-.10
145.0	.56	.62	.43	.01	.27	-.15	.10	.03
150.0	1.35	.57	.30	.02	.18	.16	-.20	.07
155.0	1.34	-.78	.39	-.29	-.36	-.16	.06	-.12
160.0	.74	-.76	.07	.40	.28	.20	.11	.07
165.0	-1.55	.40	-.02	-.33	-.20	-.14	-.16	.03
170.0	.40	-.76	.33	.23	-.03	-.24	-.09	.07
175.0	.55	-.12	-.35	-.50	.28	.20	-.04	-.15
180.0	-.70	.19	-.03	-.11	-.12	-.26	-.13	.05

PATTERN DEGRADATION IN (DB)

FREQUENCY 387.400 MHZ DRILL TOWER HEIGHT 73.400 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-10.23	-5.56	-2.55	-1.37	.06	-1.49	.62	1.42
5.0	-3.28	1.15	-.74	.42	-.08	-.45	.01	.16
10.0	-1.34	.24	.34	.24	-.26	.00	-.07	.01
15.0	.70	.25	-.25	-.37	-.26	-.17	-.06	.01
20.0	.60	.38	-.37	.04	-.10	-.18	-.04	.04
25.0	-.95	-.35	.24	.03	-.06	-.14	-.07	.02
30.0	.84	.02	-.19	-.30	-.08	.10	-.12	.03
35.0	-.70	-.22	-.34	-.37	.05	-.18	-.08	.01
40.0	-.91	.31	.06	-.38	.03	-.18	-.07	.03
45.0	-1.02	.38	-.40	.31	-.26	-.17	-.08	-.04
50.0	.25	-.51	.35	-.37	.17	-.02	-.11	.04
55.0	-1.12	-.20	.36	-.12	-.14	-.14	-.14	-.09
60.0	-1.01	.34	.32	.00	.12	.13	-.14	.04
65.0	.48	-.57	-.24	.16	-.07	-.21	.04	-.06
70.0	-.64	-.46	-.23	-.04	.22	-.23	-.15	-.12
75.0	.61	.47	-.37	-.15	-.30	.15	.07	.01
80.0	-.31	-.61	.28	.04	.22	-.11	.08	-.10
85.0	1.06	-.11	-.44	-.49	.22	-.04	-.12	.05
90.0	-.36	-.11	.41	-.41	.07	-.03	.04	.05
95.0	-1.42	.32	-.17	-.03	-.29	-.06	-.11	.05
100.0	.54	.47	.41	.39	-.19	.12	-.11	.01
105.0	.07	-.25	-.22	-.21	-.22	-.11	-.14	.04
110.0	1.10	-.15	-.57	.11	.26	-.16	.07	.04
115.0	1.03	-.67	.45	-.51	.21	-.25	.09	-.08
120.0	-.01	.18	-.22	.13	-.36	.05	-.17	.04
125.0	1.12	.49	.44	.40	-.22	.08	.03	-.15
130.0	-1.59	-.48	.08	.41	.24	-.22	.10	-.15
135.0	-1.50	-.35	.37	.37	.19	.05	-.12	-.15
140.0	1.23	-.75	.20	.21	.27	.04	-.09	-.01
145.0	-1.56	.12	.52	.05	.29	-.28	-.19	-.16
150.0	-1.44	.22	.12	-.46	.26	-.26	.06	.02
155.0	-1.65	-.75	-.64	-.59	.19	-.22	.07	-.10
160.0	-1.08	-.67	-.61	-.55	.28	.20	.07	-.02
165.0	1.23	.63	.25	-.18	-.12	-.28	.00	.05
170.0	-.14	-.14	.24	-.40	-.35	.19	-.11	-.12
175.0	-.39	-.72	-.58	-.15	.11	.13	.11	.03
180.0	.76	-.78	.33	.17	-.26	-.29	-.10	.04

PATTERN DEGRADATION IN (DB)

FREQUENCY 250.900 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	1.10 KM	1.20 KM	1.30 KM	1.40 KM	1.50 KM	1.60 KM	1.70 KM	1.80 KM
ANGLE	0.59 NM	0.64 NM	0.70 NM	0.75 NM	0.81 NM	0.86 NM	0.91 NM	0.97 NM
.0	.78	.50	.12	-.28	-.67	-1.02	-1.31	-1.54
5.0	-.01	.34	-.23	-.09	.32	-.13	-.16	.28
10.0	.02	.32	-.06	-.26	.15	.23	-.17	-.15
15.0	-.16	-.30	-.17	.08	.27	.25	.03	-.18
20.0	-.14	-.21	-.25	-.27	-.26	-.23	-.18	-.11
25.0	-.22	-.28	-.06	.18	.27	.12	-.13	-.24
30.0	.03	-.27	-.12	.23	.23	-.07	-.24	-.02
35.0	.30	.25	.05	-.17	-.26	-.16	.04	.21
40.0	-.25	.30	-.23	.16	.00	-.09	.21	-.23
45.0	.01	.05	-.04	.09	-.08	.12	-.11	.15
50.0	.30	.29	.18	.04	-.14	-.25	-.22	-.09
55.0	-.21	.28	.01	-.25	.20	.11	-.26	.13
60.0	-.06	-.29	-.24	-.01	.25	.27	.07	-.18
65.0	-.30	.27	.09	-.29	.22	.12	-.28	.12
70.0	-.26	-.31	-.31	-.25	-.15	-.02	.09	.19
75.0	-.24	-.13	-.10	-.04	.05	.07	.15	.16
80.0	-.13	.23	.34	.19	-.15	-.30	-.19	.09
85.0	.37	-.23	.06	.18	-.29	.32	-.18	.05
90.0	.30	-.31	-.03	.34	-.18	-.17	.32	-.04
95.0	.17	.16	.10	.07	.03	.00	-.03	-.06
100.0	.23	-.24	-.29	.17	.34	-.01	-.33	-.06
105.0	-.06	-.26	.37	-.16	-.13	.35	-.24	-.01
110.0	-.32	.35	.06	-.32	.26	.17	-.34	.14
115.0	-.35	-.29	-.15	-.01	.13	.24	.31	.35
120.0	-.39	.34	-.24	.20	-.07	.03	.09	-.12
125.0	.39	.12	-.38	.21	.25	-.34	.03	.33
130.0	-.35	.36	-.35	.35	-.36	.36	-.35	.36
135.0	-.29	-.41	-.27	.04	.30	.38	.23	-.05
140.0	-.01	-.41	-.19	.27	.37	.04	-.35	-.18
145.0	-.43	-.01	.41	.10	-.38	-.03	.37	.13
150.0	-.44	-.14	.24	.41	.18	-.21	-.37	-.12
155.0	-.44	.43	-.38	.33	-.22	.13	-.04	-.01
160.0	.34	-.41	.15	.28	-.38	.15	.26	-.36
165.0	.10	-.01	-.03	.15	-.18	.27	-.28	.34
170.0	-.44	-.23	.06	.31	.40	.30	.12	-.13
175.0	.43	.41	.31	.17	.01	-.14	-.26	-.34
180.0	-.45	.31	.02	-.26	.40	-.30	.09	.18

PATTERN DEGRADATION IN (DB)

FREQUENCY 251.400 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	1.10 KM	1.20 KM	1.30 KM	1.40 KM	1.50 KM	1.60 KM	1.70 KM	1.80 KM
ANGLE	0.59 NM	0.64 NM	0.70 NM	0.75 NM	0.81 NM	0.86 NM	0.91 NM	0.97 NM
.0	.78	.51	.13	-.27	-.66	-1.01	-1.30	-1.53
5.0	.00	.34	-.24	-.08	.31	-.14	-.14	.28
10.0	.07	.31	-.11	-.23	.20	.19	-.21	-.08
15.0	-.05	-.26	-.25	-.05	.18	.27	.18	-.05
20.0	-.28	-.29	-.26	-.20	-.11	-.01	.07	.14
25.0	.07	-.16	-.27	-.15	.09	.25	.23	.05
30.0	-.29	-.01	.28	.11	-.23	-.13	.21	.19
35.0	-.07	-.26	-.20	.07	.26	.20	-.02	-.22
40.0	.18	-.27	.26	-.07	-.09	.26	-.23	.14
45.0	.11	-.15	.25	-.26	.27	-.21	.15	-.05
50.0	-.07	-.15	-.20	-.24	-.26	-.26	-.23	-.18
55.0	.22	.26	-.14	-.24	.14	.26	-.08	-.24
60.0	-.23	-.29	-.29	-.24	-.13	-.01	.12	.21
65.0	-.25	.33	-.29	.22	-.08	-.07	.22	-.26
70.0	-.29	.05	.31	.24	-.07	-.29	-.16	.14
75.0	.36	.25	-.05	-.29	-.23	.01	.25	.29
80.0	.16	-.33	.09	.30	-.21	-.13	.32	.00
85.0	-.23	.16	-.01	-.09	.18	-.22	.29	-.29
90.0	-.08	-.33	-.31	-.09	.23	.34	.21	-.06
95.0	.15	.37	.23	-.08	-.33	-.19	.10	.32
100.0	-.08	-.05	.28	-.34	.35	-.24	.12	.09
105.0	-.33	.28	-.07	.01	.19	-.24	.32	-.33
110.0	.40	-.32	.24	-.16	.12	.01	-.05	.16
115.0	.27	-.37	.01	.37	-.18	-.22	.33	.06
120.0	-.09	.33	.28	-.19	-.34	.07	.36	.13
125.0	.41	.35	.27	.22	.09	-.02	-.11	-.17
130.0	-.36	-.24	.31	.29	-.23	-.31	.21	.32
135.0	.00	.34	.36	.12	-.24	-.37	-.16	.18
140.0	.42	.38	.27	.00	-.19	-.34	-.36	-.24
145.0	.13	-.22	.33	-.37	.39	-.36	.32	-.21
150.0	.37	-.31	.29	-.22	.21	-.17	.16	-.03
155.0	.42	.22	-.17	-.39	-.30	.01	.30	.37
160.0	-.22	-.17	.42	-.24	-.11	.38	-.27	-.03
165.0	.14	-.18	-.41	-.30	.07	.34	.37	.18
170.0	.26	-.33	.38	-.40	.38	-.26	.17	.01
175.0	-.24	.43	-.38	.22	.03	-.23	.38	-.31
180.0	.28	.27	-.38	-.11	.40	-.07	-.34	.25

PATTERN DEGRADATION IN (DB)

FREQUENCY 273.000 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	1.10 KM	1.20 KM	1.30 KM	1.40 KM	1.50 KM	1.60 KM	1.70 KM	1.80 KM
ANGLE	0.59 NM	0.64 NM	0.70 NM	0.75 NM	0.81 NM	0.86 NM	0.91 NM	0.97 NM
.0	.86	.76	.51	.17	-.20	-.56	-.89	-1.18
5.0	.29	-.03	-.20	.26	-.08	-.13	.24	-.12
10.0	.14	.07	-.19	.23	-.14	.00	.15	-.20
15.0	.01	-.14	-.22	-.21	-.11	.03	.15	.21
20.0	.25	-.24	.24	-.23	.23	-.22	.22	-.20
25.0	.27	-.25	.23	-.19	.16	-.12	.10	-.02
30.0	.19	.24	-.04	-.23	-.11	.16	.21	-.01
35.0	-.15	.12	-.05	.02	.03	-.08	.13	-.14
40.0	.26	-.20	-.09	.26	-.07	-.19	.21	.07
45.0	-.15	-.13	.28	-.08	-.17	.25	-.08	-.15
50.0	-.16	.12	-.07	.04	.05	-.05	.11	-.15
55.0	-.29	-.19	.11	.28	.18	-.09	-.26	-.14
60.0	.12	-.15	.21	-.23	.27	-.27	.28	-.26
65.0	.28	-.32	.29	-.16	.07	.09	-.19	.26
70.0	.06	.21	.29	.31	.25	.14	-.01	-.15
75.0	.17	-.15	.17	-.15	.17	-.16	.19	-.18
80.0	.29	-.22	-.24	.23	.21	-.20	-.22	.20
85.0	-.28	-.36	-.21	.05	.28	.32	.20	-.06
90.0	-.19	-.29	-.34	-.33	-.24	-.17	-.05	.07
95.0	-.11	-.11	-.11	-.11	-.11	-.14	-.13	-.13
100.0	-.29	-.38	-.26	.00	.24	.34	.25	.02
105.0	-.23	-.02	.30	-.35	.19	.11	-.30	.31
110.0	-.15	.32	.30	-.14	-.35	-.02	.32	.21
115.0	.22	-.11	.01	.13	-.20	.29	-.32	.34
120.0	-.36	.40	-.30	.13	.12	-.27	.35	-.28
125.0	.32	.20	-.39	.06	.34	-.22	-.20	.33
130.0	.43	-.35	.16	.11	-.28	.36	-.31	.17
135.0	.09	-.17	.27	-.32	.36	-.37	.35	-.29
140.0	.35	.36	-.03	-.37	-.29	.13	.36	.20
145.0	.28	.11	-.38	.32	.04	-.35	.33	.02
150.0	.41	.30	.14	-.04	-.21	-.33	-.37	-.33
155.0	.22	.08	-.27	.39	-.36	.23	.01	-.19
160.0	-.46	.24	.13	-.37	.36	-.10	-.22	.36
165.0	-.05	.02	.09	.15	.19	.23	.27	.30
170.0	-.35	-.20	.37	.19	-.36	-.12	.36	.11
175.0	.44	.00	-.41	-.13	.34	.27	-.19	-.35
180.0	.04	.34	.41	.26	-.04	-.30	-.37	-.22

PATTERN DEGRADATION IN (DB)

FREQUENCY 277.100 MHZ DRILL TOWER HEIGHT 73.400 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	1.10 KM	1.20 KM	1.30 KM	1.40 KM	1.50 KM	1.60 KM	1.70 KM	1.80 KM
ANGLE	0.59 NM	0.64 NM	0.70 NM	0.75 NM	0.81 NM	0.86 NM	0.91 NM	0.97 NM
.0	.85	.79	.56	.24	-.12	-.48	-.81	-1.11
5.0	.31	-.10	-.14	.27	-.17	-.05	.23	-.20
10.0	.27	-.24	.14	.02	-.14	.22	-.21	.14
15.0	-.03	.19	.24	.11	-.10	-.22	-.15	.04
20.0	.23	-.25	.23	-.15	.07	.05	-.13	.20
25.0	-.18	.25	-.09	-.13	.24	-.11	-.09	.22
30.0	.16	.06	-.20	.25	-.18	.01	.16	-.22
35.0	.29	-.02	-.24	.13	.19	-.18	-.08	.23
40.0	-.27	.13	.08	-.22	.25	-.12	-.05	.22
45.0	.29	.26	.17	.06	-.06	-.16	-.24	-.24
50.0	.29	.29	.28	.28	.27	.26	.25	.23
55.0	.22	-.05	-.08	.22	-.27	.25	-.16	.04
60.0	.01	-.30	-.13	.23	.23	-.11	-.27	.01
65.0	-.34	.22	.04	-.21	.29	-.14	-.07	.25
70.0	.32	.20	-.15	-.31	-.09	.22	.28	.02
75.0	.07	-.02	.02	.02	-.01	.08	-.04	.07
80.0	-.34	.15	.11	-.28	.31	-.16	-.04	.24
85.0	.38	-.26	.03	.23	-.32	.24	.00	-.20
90.0	-.01	-.11	.25	-.32	.33	-.30	.19	-.05
95.0	-.39	.37	-.34	.35	-.34	.33	-.31	.31
100.0	.25	-.25	.28	-.29	.28	-.31	.31	-.32
105.0	-.38	.11	.23	-.36	.22	.10	-.31	.28
110.0	-.02	.10	.19	.26	.31	.34	.34	.32
115.0	-.36	.33	-.31	.31	-.28	.29	-.24	.24
120.0	.22	-.41	.28	.07	-.32	.33	-.07	-.21
125.0	-.35	.25	-.11	.01	.14	-.22	.31	-.34
130.0	-.42	-.33	-.01	.33	.35	.08	-.25	-.34
135.0	.01	-.41	-.19	.28	.32	-.10	-.36	-.05
140.0	-.45	-.03	.40	.07	-.36	-.14	.32	.21
145.0	-.21	-.43	-.28	.08	.34	.34	.10	-.22
150.0	.28	-.22	.20	-.09	.07	.02	-.04	.12
155.0	-.15	.34	.34	-.11	-.38	-.09	.31	.29
160.0	-.45	.21	.31	-.33	-.12	.38	-.03	-.35
165.0	.27	.26	-.38	-.10	.39	-.10	-.32	.27
170.0	-.10	-.01	.14	-.21	.30	-.34	.37	-.37
175.0	.22	-.22	.25	-.25	.28	-.28	.29	-.29
180.0	-.19	-.43	-.35	-.03	.27	.38	.24	-.07

PATTERN DEGRADATION IN (DB)

FREQUENCY 277.900 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	1.10 KM	1.20 KM	1.30 KM	1.40 KM	1.50 KM	1.60 KM	1.70 KM	1.80 KM
ANGLE	0.59 NM	0.64 NM	0.70 NM	0.75 NM	0.81 NM	0.86 NM	0.91 NM	0.97 NM
.0	.85	.80	.57	.25	-.10	-.46	-.80	-1.10
5.0	.32	-.12	-.13	.27	-.18	-.03	.22	-.21
10.0	.25	-.26	.20	-.06	-.06	.18	-.22	.19
15.0	.14	.26	.16	-.07	-.22	-.16	.04	.20
20.0	.23	-.12	-.01	.15	-.22	.23	-.16	.05
25.0	-.16	-.10	.25	-.07	-.16	.22	-.01	-.19
30.0	.06	-.16	.24	-.24	.20	-.11	-.01	.14
35.0	-.28	-.08	.24	.13	-.20	-.15	.17	.18
40.0	.05	.24	-.22	-.04	.25	-.14	-.12	.24
45.0	.18	.29	.17	-.10	-.25	-.20	.04	.20
50.0	.31	.25	.06	-.11	-.24	-.24	-.11	.03
55.0	.23	-.20	.13	-.09	.06	.01	-.03	.09
60.0	-.11	.30	-.23	.00	.24	-.27	.07	.18
65.0	.14	-.10	.07	-.01	-.05	.07	-.09	.13
70.0	.33	.31	.29	.28	.27	.25	.24	.23
75.0	-.26	.29	.10	-.32	.09	.26	-.21	-.12
80.0	.21	-.33	.32	-.19	.01	.19	-.29	.28
85.0	-.19	-.06	.28	-.33	.21	.06	-.22	.30
90.0	.19	.26	-.28	-.04	.32	-.15	-.20	.29
95.0	-.11	-.37	-.01	.32	.14	-.28	-.21	.21
100.0	-.33	-.25	.20	.34	.02	-.32	-.20	.22
105.0	.33	.12	-.37	.16	.24	-.32	.02	.30
110.0	-.20	.37	-.37	.24	-.02	-.13	.31	-.33
115.0	-.40	-.37	-.13	.16	.34	.33	.13	-.14
120.0	.13	.00	-.12	-.22	-.29	-.34	-.35	-.34
125.0	.43	.27	-.04	-.31	-.36	-.17	.13	.32
130.0	-.24	-.28	.34	.13	-.38	.08	.34	-.15
135.0	-.01	.41	.08	-.38	-.07	.36	.11	-.34
140.0	-.26	-.26	.37	.08	-.38	.14	.30	-.25
145.0	-.28	-.05	.34	-.38	.19	.13	-.35	.33
150.0	-.14	-.06	.00	.06	.07	.12	.21	.25
155.0	.00	.42	-.16	-.31	.28	.16	-.37	.02
160.0	.16	.43	.17	-.29	-.35	.06	.36	.20
165.0	.33	.33	-.24	-.34	.22	.35	-.10	-.36
170.0	.41	.40	.39	.39	.37	.37	.37	.37
175.0	-.21	-.13	-.01	.10	.20	.30	.32	.35
180.0	-.43	.38	-.15	-.09	.31	-.39	.30	-.08

PATTERN DEGRADATION IN (DB)

FREQUENCY 283.400 MHZ DRILL TOWER HEIGHT 73.400 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	1.10 KM	1.20 KM	1.30 KM	1.40 KM	1.50 KM	1.60 KM	1.70 KM	1.80 KM
ANGLE	0.59 NM	0.64 NM	0.70 NM	0.75 NM	0.81 NM	0.86 NM	0.91 NM	0.97 NM
.0	.82	.83	.64	.35	.00	-.35	-.69	-1.00
5.0	.34	-.23	-.03	.25	-.27	.10	.14	-.25
10.0	-.16	.06	.05	-.15	.22	-.25	.23	-.18
15.0	-.28	-.09	.23	.17	-.17	-.21	.08	.23
20.0	.00	.26	-.14	-.15	.23	.02	-.23	.12
25.0	-.28	-.12	.11	.24	.20	.02	-.17	-.23
30.0	.19	-.27	.09	.17	-.25	.07	.15	-.23
35.0	.22	.07	-.10	-.22	-.25	-.20	-.08	.06
40.0	.19	.28	.23	.07	-.11	-.23	-.22	-.11
45.0	-.14	-.18	.26	-.01	-.24	.19	.09	-.25
50.0	.27	.19	-.19	-.22	.14	.24	-.07	-.25
55.0	-.26	.26	.05	-.27	.17	.15	-.26	.06
60.0	-.16	.29	.09	-.29	-.01	.28	-.03	-.26
65.0	-.09	-.09	.21	-.29	.29	-.21	.11	.05
70.0	.29	-.08	-.32	-.09	.25	.24	-.11	-.28
75.0	.12	-.06	-.16	-.26	-.30	-.29	-.24	-.14
80.0	-.25	-.33	-.22	-.03	.18	.30	.27	.11
85.0	.34	.06	-.34	.14	.25	-.26	-.06	.30
90.0	.14	-.04	-.02	.11	-.18	.21	-.25	.28
95.0	-.38	.01	.33	.11	-.31	-.17	.25	.23
100.0	.35	.37	.36	.32	.25	.16	.06	-.05
105.0	-.19	-.18	-.18	-.17	-.17	-.19	-.15	-.15
110.0	-.41	-.34	-.06	.22	.35	.25	-.01	-.27
115.0	.37	-.37	.36	-.37	.35	-.36	.34	-.33
120.0	-.10	.35	.29	-.14	-.37	-.06	.31	.25
125.0	-.42	-.13	.36	.16	-.34	-.15	.31	.17
130.0	-.11	-.35	.31	.15	-.38	.08	.30	-.24
135.0	43	-.24	-.03	.30	-.37	.25	.04	-.26
140.0	.40	.38	.39	.35	.27	.18	.10	-.06
145.0	.30	.33	.35	.37	.38	.37	.35	.32
150.0	-.02	.28	-.40	.37	-.21	.00	.24	-.35
155.0	-.47	-.08	.36	.27	-.21	-.36	.03	.35
160.0	.33	-.44	.26	.04	-.34	.36	-.17	-.16
165.0	-.20	.22	.41	.28	-.10	-.37	-.31	.05
170.0	.38	-.43	.22	.13	-.35	.36	-.15	-.12
175.0	-.09	-.38	.30	.23	-.39	.03	.35	-.21
180.0	-.26	-.07	.11	.27	.34	.37	.36	.29

PATTERN DEGRADATION IN (DB)

FREQUENCY 300.500 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	1.10 KM	1.20 KM	1.30 KM	1.40 KM	1.50 KM	1.60 KM	1.70 KM	1.80 KM
ANGLE	0.59 NM	0.64 NM	0.70 NM	0.75 NM	0.81 NM	0.86 NM	0.91 NM	0.97 NM
.0	.66	.84	.78	.58	.29	-.04	-.37	-.69
5.0	.16	-.39	.38	-.20	-.08	.29	-.35	.21
10.0	.05	.01	-.05	.10	-.14	.17	-.21	.23
15.0	-.37	.32	-.21	.05	.11	-.24	.28	-.27
20.0	.29	.30	.29	.26	.20	.15	.08	.01
25.0	.07	-.23	.27	-.21	.05	.12	-.23	.23
30.0	.23	-.28	.25	-.20	.11	.00	-.10	.18
35.0	-.02	-.22	-.27	-.15	.04	.19	.23	.13
40.0	-.09	.01	.05	-.12	.19	-.23	.23	-.23
45.0	.07	.18	-.28	.17	.04	-.22	.22	-.07
50.0	.08	.29	.14	-.19	-.25	-.01	.24	.15
55.0	.31	.06	-.29	-.04	.26	.04	-.27	.01
60.0	-.12	.12	.27	.27	.13	-.06	-.23	-.27
65.0	-.34	-.30	-.11	.12	.26	.25	.10	-.12
70.0	.34	.30	.24	.17	.09	.00	-.08	-.13
75.0	-.07	-.31	.22	.16	-.30	.01	.27	-.15
80.0	.06	-.29	-.31	-.03	.25	.28	.02	-.25
85.0	-.03	.04	-.02	.02	-.01	-.01	-.01	.02
90.0	-.39	-.15	.30	.18	-.27	-.22	.21	.22
95.0	.19	.23	.26	.28	.30	.31	.31	.30
100.0	.16	.19	-.37	.26	.03	-.28	.31	-.12
105.0	.04	.36	.27	-.14	-.35	-.17	.18	.32
110.0	.18	-.12	.07	-.01	-.03	.07	-.10	.14
115.0	.01	-.24	.36	-.33	.21	.00	-.19	.31
120.0	.13	.24	-.40	.24	.08	-.33	.30	-.10
125.0	-.23	-.33	.28	.23	-.32	-.14	.33	.05
130.0	-.03	-.35	.35	-.01	-.32	.31	.03	-.30
135.0	-.44	-.41	-.19	.09	.30	.35	.24	-.02
140.0	.07	.00	-.06	-.12	-.16	-.21	-.24	-.27
145.0	-.35	.39	-.16	-.22	.37	-.21	-.13	.34
150.0	.28	.16	.04	-.11	-.18	-.26	-.32	-.35
155.0	-.44	-.45	-.34	-.16	.08	.24	.34	.35
160.0	.30	-.41	.40	-.37	.24	-.08	-.08	.23
165.0	.46	.38	.33	.22	.04	-.05	-.18	-.28
170.0	-.01	-.14	-.25	-.33	-.38	-.39	-.36	-.30
175.0	-.03	-.27	-.41	-.40	-.26	-.05	.16	.30
180.0	-.46	.38	-.34	.27	-.21	.15	-.08	.02

PATTERN DEGRADATION IN (DB)

FREQUENCY 312.700 MHZ DRILL TOWER HEIGHT 73.400 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	1.10 KM	1.20 KM	1.30 KM	1.40 KM	1.50 KM	1.60 KM	1.70 KM	1.80 KM
ANGLE	0.59 NM	0.64 NM	0.70 NM	0.75 NM	0.81 NM	0.86 NM	0.91 NM	0.97 NM
.0	.49	.79	.83	.70	.46	.16	-.16	-.47
5.0	-.29	-.04	.32	-.48	.38	-.18	-.09	.30
10.0	.32	-.44	.38	-.28	.09	.11	-.28	.33
15.0	.37	-.35	.25	-.16	.05	.06	-.16	.22
20.0	-.31	.17	.16	-.26	-.05	.25	-.09	-.22
25.0	-.10	.23	.15	-.18	-.20	.10	.21	-.03
30.0	.26	.23	.21	.18	.15	.12	.10	.05
35.0	.08	.24	.22	.06	-.13	-.23	-.18	-.02
40.0	-.25	.27	-.23	.09	.05	-.18	.22	-.21
45.0	-.09	-.01	.09	-.17	.21	-.25	.23	-.23
50.0	.31	.00	-.30	.03	.25	-.07	-.25	.08
55.0	.26	-.23	.18	-.15	.13	-.10	.03	.00
60.0	.16	.29	.20	-.07	-.27	-.23	.00	.21
65.0	.23	-.21	-.28	.11	.27	-.02	-.28	-.05
70.0	.21	.06	-.28	.26	-.14	-.10	.26	-.24
75.0	.17	-.35	.06	.26	-.25	-.08	.28	-.14
80.0	-.38	-.24	.16	.29	.05	-.27	-.21	.09
85.0	-.03	-.38	-.09	.27	.19	-.20	-.30	.04
90.0	.25	.19	-.36	.06	.27	-.26	-.10	.29
95.0	-.42	.26	-.04	-.18	.30	-.33	.19	-.04
100.0	-.24	.03	.15	-.29	.31	-.32	.20	-.05
105.0	-.09	.38	-.18	-.22	.30	.04	-.34	.16
110.0	.25	.19	.14	.12	.06	.01	-.03	-.07
115.0	.42	-.35	.12	.15	-.34	.32	-.19	-.04
120.0	-.47	.39	-.37	.28	-.22	.13	-.04	-.05
125.0	-.20	.12	.34	.34	.12	-.18	-.35	-.26
130.0	.21	.15	-.41	.28	.03	-.31	.32	-.10
135.0	-.38	-.43	-.42	-.34	-.23	-.09	.05	.17
140.0	.20	.41	.03	-.38	-.21	.24	.31	-.08
145.0	-.44	-.19	.36	.17	-.35	-.16	.32	.14
150.0	.15	.22	-.42	.25	.04	-.30	.35	-.19
155.0	-.10	.31	.39	.13	-.24	-.39	-.17	.15
160.0	-.50	.14	.29	-.38	.05	.31	-.33	-.04
165.0	-.50	-.40	-.33	-.19	-.05	.09	.20	.29
170.0	.38	.31	.24	.16	.10	.03	-.07	-.09
175.0	.33	-.24	-.41	.06	.37	.10	-.35	-.21
180.0	-.50	.37	-.13	-.16	.34	-.38	.21	.03

PATTERN DEGRADATION IN (DB)

FREQUENCY 313.800 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	1.10 KM	1.20 KM	1.30 KM	1.40 KM	1.50 KM	1.60 KM	1.70 KM	1.80 KM
ANGLE	0.59 NM	0.64 NM	0.70 NM	0.75 NM	0.81 NM	0.86 NM	0.91 NM	0.97 NM
.0	.47	.78	.83	.70	.47	.18	-.14	-.46
5.0	-.33	.01	.29	-.47	.41	-.23	-.04	.27
10.0	.41	-.45	.30	-.11	-.11	.27	-.38	.32
15.0	.23	-.09	-.07	.19	-.28	.30	-.31	.22
20.0	.09	.22	-.26	-.03	.24	-.18	-.12	.24
25.0	-.13	-.27	-.08	.19	.20	-.06	-.23	-.11
30.0	-.29	-.27	-.25	-.22	-.20	-.17	-.15	-.12
35.0	.24	.15	.04	-.06	-.16	-.22	-.24	-.21
40.0	-.31	.27	-.28	.24	-.26	.23	-.24	.21
45.0	.21	-.30	.11	.14	-.27	.13	.12	-.25
50.0	-.29	.09	.07	-.24	.25	-.18	.01	.14
55.0	-.28	.03	.19	-.29	.17	.04	-.23	.23
60.0	.15	.17	-.30	.14	.13	-.29	.15	.11
65.0	-.35	.23	-.12	.00	.10	-.21	.25	-.28
70.0	.06	-.21	-.33	-.26	-.04	.17	.26	.20
75.0	.26	-.10	-.08	.21	-.30	.28	-.22	.09
80.0	.00	.01	-.01	.01	-.02	.02	-.03	.03
85.0	.33	-.37	.33	-.31	.22	-.15	.02	.04
90.0	.26	-.38	.08	.25	-.32	.03	.25	-.28
95.0	.19	-.28	-.33	.07	.32	.12	-.23	-.26
100.0	.39	.30	-.01	-.30	-.33	-.10	.19	.31
105.0	.04	-.41	-.10	.32	.15	-.30	-.20	.24
110.0	.06	-.12	.17	-.18	.24	-.29	.29	-.31
115.0	-.08	-.29	-.39	-.37	-.24	-.05	.14	.27
120.0	-.46	-.42	-.39	-.33	-.31	-.30	-.31	-.29
125.0	.43	-.17	-.32	.29	.15	-.36	.02	.31
130.0	-.41	-.30	-.19	-.08	.02	.12	.17	.26
135.0	.01	.38	-.30	-.15	.36	-.14	-.26	.31
140.0	.38	.03	-.31	-.40	-.20	.13	.33	.28
145.0	.32	-.10	-.11	.27	-.38	.34	-.26	.08
150.0	-.18	.42	-.21	-.22	.36	-.12	-.27	.32
155.0	.42	-.45	.40	-.39	.31	-.22	.17	-.09
160.0	-.04	-.13	-.21	-.27	-.33	-.36	-.38	-.38
165.0	-.37	.23	.38	-.02	-.40	-.08	.33	.19
170.0	.43	.19	-.35	-.20	.32	.21	-.31	-.23
175.0	.31	.37	.39	.38	.34	.27	.17	.05
180.0	-.51	.26	.14	-.40	.29	.03	-.33	.31

PATTERN DEGRADATION IN (DB)

FREQUENCY 321.800 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	1.10 KM	1.20 KM	1.30 KM	1.40 KM	1.50 KM	1.60 KM	1.70 KM	1.80 KM
ANGLE	0.59 NM	0.64 NM	0.70 NM	0.75 NM	0.81 NM	0.86 NM	0.91 NM	0.97 NM
.0	.32	.72	.84	.76	.56	.29	-.01	-.32
5.0	-.60	.35	-.05	-.24	.42	-.50	.36	-.15
10.0	-.33	.44	-.32	-.02	.30	-.42	.22	.06
15.0	.27	.04	-.32	.27	-.02	-.27	.26	-.07
20.0	-.31	.26	-.27	.23	-.22	.17	-.16	.10
25.0	-.16	-.22	-.25	-.24	-.21	-.14	-.08	-.01
30.0	-.16	-.06	.19	-.25	.14	.00	-.16	.20
35.0	.20	-.28	.24	-.18	.04	.05	-.18	.21
40.0	-.08	-.25	-.29	-.19	-.02	.14	.22	.19
45.0	-.19	.05	.02	-.12	.17	-.25	.23	-.23
50.0	.02	.23	-.28	.09	.16	-.27	.11	.11
55.0	.31	-.03	-.31	-.07	.22	.12	-.19	-.19
60.0	-.19	.31	-.14	-.18	.26	-.10	-.18	.24
65.0	.08	.12	.15	.17	.19	.21	.23	.24
70.0	.28	-.35	.13	.07	-.27	.26	-.13	-.10
75.0	-.16	.02	.09	-.22	.25	-.31	.25	-.24
80.0	.11	-.38	.10	.25	-.22	-.12	.28	-.07
85.0	-.42	-.38	-.36	-.33	-.31	-.29	-.27	-.25
90.0	.36	-.18	-.18	.30	-.21	-.07	.29	-.23
95.0	-.44	.12	.27	-.30	-.09	.31	-.13	-.24
100.0	.00	.05	.09	.12	.15	.17	.20	.22
105.0	-.44	-.33	-.12	.16	.31	.29	.10	-.15
110.0	-.28	-.36	-.39	-.35	-.33	-.24	-.14	-.03
115.0	.13	.33	-.30	-.17	.33	-.03	-.33	.19
120.0	-.07	-.09	-.14	-.15	-.20	-.19	-.21	-.23
125.0	.31	.10	-.10	-.27	-.38	-.34	-.22	.00
130.0	-.26	-.19	.38	-.25	-.11	.31	-.27	-.07
135.0	.42	-.15	-.41	.09	.35	-.06	-.37	.06
140.0	-.46	.42	-.38	.22	-.07	-.10	.22	-.33
145.0	.44	.05	-.43	.06	.32	-.15	-.29	.21
150.0	.28	-.44	.03	.36	-.24	-.17	.34	-.03
155.0	-.45	.14	.19	-.40	.32	-.10	-.19	.33
160.0	.35	.36	-.15	-.42	-.07	.33	.22	-.22
165.0	.06	.12	.17	.22	.26	.29	.31	.33
170.0	.46	.41	.32	.21	.09	-.04	-.16	-.25
175.0	-.43	-.19	.39	.04	-.41	.08	.33	-.18
180.0	.36	-.43	.00	.36	-.29	-.13	.35	-.18

PATTERN DEGRADATION IN (DB)

FREQUENCY 336.200 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	1.10 KM	1.20 KM	1.30 KM	1.40 KM	1.50 KM	1.60 KM	1.70 KM	1.80 KM
ANGLE	0.59 NM	0.64 NM	0.70 NM	0.75 NM	0.81 NM	0.86 NM	0.91 NM	0.97 NM
.0	.02	.55	.79	.82	.69	.48	.20	-.09
5.0	-.45	.57	-.66	.49	-.31	.05	.19	-.40
10.0	.30	.26	-.46	-.01	.38	-.23	-.27	.34
15.0	.19	-.15	-.32	-.13	.16	.24	.04	-.22
20.0	-.25	-.16	.16	.14	-.15	-.20	.09	.16
25.0	.15	-.15	.11	-.12	.08	-.09	.05	-.07
30.0	-.04	-.08	-.12	-.15	-.18	-.20	-.22	-.23
35.0	-.33	.06	.20	-.17	-.17	.19	.06	-.24
40.0	-.32	-.12	.22	.12	-.22	-.15	.15	.16
45.0	-.26	-.29	-.07	.16	.23	.10	-.12	-.25
50.0	-.27	-.31	-.31	-.27	-.20	-.11	-.02	.07
55.0	.04	.28	.18	-.12	-.28	-.15	.13	.23
60.0	-.37	-.34	-.26	-.14	-.01	.11	.20	.24
65.0	-.33	.18	.24	-.18	-.26	.13	.21	-.16
70.0	-.20	.23	.25	-.11	-.31	-.07	.23	.16
75.0	-.41	-.30	-.07	.16	.27	.23	.07	-.14
80.0	.32	.00	-.32	.25	.03	-.30	.21	.08
85.0	-.21	-.13	.30	-.33	.11	.08	-.30	.25
90.0	-.38	-.39	-.12	.18	.30	.19	-.07	-.29
95.0	-.45	-.37	-.22	-.04	.12	.24	.29	.27
100.0	.16	-.38	.34	-.19	-.09	.26	-.34	.18
105.0	-.47	-.21	.19	.34	.13	-.24	-.35	-.12
110.0	.09	-.09	.07	-.09	.07	-.12	.07	-.09
115.0	.31	-.38	.35	-.40	.33	-.33	.24	-.20
120.0	.43	.03	-.39	-.19	.26	.25	-.17	-.34
125.0	-.50	.40	-.39	.29	-.28	.20	-.14	.05
130.0	-.38	.22	.35	-.15	-.39	.02	.33	.05
135.0	-.11	.24	-.36	.32	-.38	.31	-.26	.13
140.0	.14	-.01	-.14	-.26	-.34	-.37	-.38	-.34
145.0	-.51	-.47	-.43	-.40	-.38	-.36	-.34	-.30
150.0	.21	-.44	-.13	.37	.03	-.39	.03	.33
155.0	-.08	-.48	-.11	.34	.22	-.25	-.34	.06
160.0	.13	-.19	.22	-.29	.29	-.35	.33	-.37
165.0	.43	-.48	.40	-.42	.33	-.33	.26	-.21
170.0	-.13	.30	-.44	.36	-.28	.06	.12	-.29
175.0	-.15	.24	.40	.29	-.01	-.31	-.39	-.20
180.0	.46	-.04	-.43	.21	.25	-.35	-.09	.34

PATTERN DEGRADATION IN (DB)

FREQUENCY 340.400 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	1.10 KM	1.20 KM	1.30 KM	1.40 KM	1.50 KM	1.60 KM	1.70 KM	1.80 KM
ANGLE	0.59 NM	0.64 NM	0.70 NM	0.75 NM	0.81 NM	0.86 NM	0.91 NM	0.97 NM
.0	-.07	.49	.77	.82	.72	.52	.26	-.03
5.0	-.24	.46	-.64	.58	-.54	.32	-.10	-.14
10.0	-.36	.37	.18	-.44	-.05	.38	-.09	-.38
15.0	-.21	.03	.20	.24	.12	-.08	-.24	-.24
20.0	-.28	-.12	.09	.20	.13	-.06	-.20	-.20
25.0	-.29	.07	.12	-.27	.16	-.01	-.20	.20
30.0	-.09	-.31	-.08	.21	.14	-.16	-.23	.02
35.0	-.01	.04	-.12	.14	-.20	.19	-.24	.20
40.0	.29	-.28	.17	-.10	-.03	.09	-.19	.20
45.0	.29	-.10	-.26	.08	.21	-.13	-.23	.11
50.0	.13	-.24	.24	-.30	.22	-.20	.09	.00
55.0	-.08	.19	-.30	.26	-.23	.09	.01	-.16
60.0	.29	.18	-.23	-.25	.11	.24	-.06	-.28
65.0	.07	.03	-.16	.21	-.30	.24	-.27	.17
70.0	-.29	.28	.08	-.33	.04	.24	-.19	-.18
75.0	.12	.32	.23	-.06	-.30	-.26	-.01	.22
80.0	-.11	-.38	-.24	.10	.29	.18	-.13	-.31
85.0	-.09	.32	-.30	.00	.21	-.33	.11	.13
90.0	-.13	-.02	.08	-.19	.23	-.31	.28	-.32
95.0	.26	-.37	.34	-.36	.26	-.20	.07	.02
100.0	.05	.37	-.11	-.36	.13	.27	-.20	-.24
105.0	.04	-.14	-.28	-.35	-.37	-.33	-.26	-.12
110.0	-.22	-.13	.31	-.38	.19	.00	-.24	.30
115.0	-.26	.15	-.09	-.04	.07	-.16	.18	-.26
120.0	.43	-.16	-.26	.33	-.08	-.29	.26	.05
125.0	-.41	-.05	.35	-.31	-.12	.32	-.24	-.13
130.0	.07	-.15	.19	-.28	.28	-.35	.32	-.37
135.0	.29	-.16	-.43	-.28	.06	.33	.23	-.10
140.0	-.03	.08	-.16	.19	-.26	.27	-.33	.31
145.0	-.40	.40	-.45	.34	-.29	.15	-.04	-.10
150.0	.06	-.29	-.45	-.35	-.12	.18	.32	.29
155.0	.43	-.36	.21	-.12	.02	.10	-.22	.26
160.0	-.52	.03	.37	-.03	-.41	-.01	.34	.01
165.0	.18	-.41	-.31	.23	.32	-.16	-.39	.02
170.0	-.14	.39	-.42	.12	.17	-.39	.29	-.06
175.0	.36	-.47	.08	.26	-.41	.14	.22	-.38
180.0	-.37	-.11	.14	.30	.34	.31	.16	-.08

PATTERN DEGRADATION IN (DB)

FREQUENCY 361.800 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	1.10 KM	1.20 KM	1.30 KM	1.40 KM	1.50 KM	1.60 KM	1.70 KM	1.80 KM
ANGLE	0.59 NM	0.64 NM	0.70 NM	0.75 NM	0.81 NM	0.86 NM	0.91 NM	0.97 NM
.0	-.58	.13	.58	.79	.81	.70	.51	.26
5.0	.73	-.74	.53	-.42	.23	-.06	-.11	.24
10.0	-.47	-.27	.14	.34	.19	-.16	-.38	-.22
15.0	.17	.21	.15	.01	-.13	-.22	-.21	-.11
20.0	.25	-.16	-.25	.17	.11	-.26	-.07	.20
25.0	-.02	.22	-.20	-.15	.21	-.08	-.22	.15
30.0	-.28	-.02	.19	.17	-.04	-.22	-.20	.00
35.0	.10	.26	.10	-.17	-.27	-.12	.12	.18
40.0	.26	-.12	-.30	.02	.22	-.02	-.26	-.07
45.0	-.10	.25	-.26	-.02	.18	-.26	.04	.10
50.0	-.35	-.27	-.09	.10	.21	.21	.11	-.05
55.0	.10	-.04	-.08	.09	-.19	.17	-.26	.21
60.0	.28	-.02	-.29	.24	-.06	-.23	.22	-.11
65.0	.29	.02	-.33	.19	.07	-.29	.08	.13
70.0	-.40	.31	-.23	.00	.12	-.25	.25	-.24
75.0	-.43	.29	-.25	.11	-.05	-.09	.12	-.24
80.0	.36	.01	-.38	.05	.26	-.17	-.27	.17
85.0	-.32	-.41	-.13	.20	.26	.08	-.22	-.32
90.0	-.36	-.12	.33	-.19	-.20	.28	-.10	-.26
95.0	.25	.34	-.05	-.38	-.19	.20	.25	-.08
100.0	-.05	.30	-.41	.14	.12	-.35	.23	-.04
105.0	.37	.20	-.01	-.19	-.32	-.37	-.33	-.22
110.0	.42	.37	.30	.22	.15	.06	-.02	-.10
115.0	-.34	-.19	.37	-.17	-.28	.26	-.02	-.33
120.0	.43	.39	.34	.29	.24	.19	.13	.08
125.0	-.37	-.12	.13	.29	.33	.27	.12	-.08
130.0	.44	.01	-.45	-.02	.32	-.06	-.36	.05
135.0	.32	.30	.24	.19	.10	.08	.03	-.01
140.0	.34	.01	-.32	-.44	-.27	.04	.27	.30
145.0	-.45	.40	-.46	.36	-.34	.21	-.22	.08
150.0	-.52	-.30	.22	.36	.00	-.38	-.24	.17
155.0	.07	.21	.30	.35	.35	.27	.21	.09
160.0	.46	.41	.25	.03	-.19	-.35	-.40	-.32
165.0	-.18	.41	.12	-.43	-.11	.33	.03	-.38
170.0	-.20	.05	-.01	-.14	.15	-.28	.26	-.35
175.0	.05	-.22	-.42	-.45	-.34	-.15	.03	.23
180.0	.14	.22	-.47	.30	-.06	-.28	.32	-.27

PATTERN DEGRADATION IN (DB)

FREQUENCY 385.000 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM						
	1.10 KM	1.20 KM	1.30 KM	1.40 KM	1.50 KM	1.60 KM	1.70 KM	1.80 KM
ANGLE	0.59 NM	0.64 NM	0.70 NM	0.75 NM	0.81 NM	0.86 NM	0.91 NM	0.97 NM
.0	-1.06	-.35	.25	.62	.79	.79	.69	.51
5.0	-.19	.11	-.05	-.02	.05	-.13	.15	-.23
10.0	-.05	-.13	-.22	-.27	-.29	-.30	-.27	-.24
15.0	-.24	.26	-.26	-.01	.13	-.28	.15	-.06
20.0	.26	.05	-.31	-.08	.21	.01	-.27	-.05
25.0	-.32	-.30	-.26	-.22	-.18	-.12	-.10	-.06
30.0	-.03	.24	.12	-.19	-.25	-.01	.18	.06
35.0	-.13	-.33	-.04	.19	.03	-.24	-.17	.11
40.0	-.17	-.11	-.03	.04	.10	.14	.17	.18
45.0	-.11	.21	-.33	.16	-.04	-.19	.19	-.24
50.0	-.38	-.28	-.04	.16	.22	.14	-.01	-.20
55.0	-.20	-.34	.07	.23	-.10	-.30	-.01	.21
60.0	.33	.05	-.32	-.22	.12	.22	-.06	-.29
65.0	-.06	.22	.26	.09	-.16	-.31	-.23	.00
70.0	.34	-.41	.30	-.36	.24	-.33	.22	-.31
75.0	.36	.13	-.25	-.33	-.05	.21	.20	-.09
80.0	.06	.27	.31	.19	-.05	-.26	-.33	-.20
85.0	-.45	-.22	.26	.21	-.23	-.28	.09	.24
90.0	.34	-.45	.28	-.20	-.03	.11	-.29	.25
95.0	-.11	-.23	.31	-.38	.13	.04	-.29	.26
100.0	-.48	.15	.26	-.33	-.20	.27	.02	-.35
105.0	-.26	.38	-.27	-.17	.30	-.27	-.12	.26
110.0	-.51	.12	.21	-.42	.15	.11	-.34	.19
115.0	.40	-.34	-.21	.31	-.11	-.33	.22	.08
120.0	.35	-.49	.20	.07	-.37	.29	-.15	-.19
125.0	-.54	-.44	-.26	-.05	.15	.26	.30	.26
130.0	.44	.38	.31	.24	.18	.12	.06	.02
135.0	-.51	.07	.38	.00	-.40	-.14	.28	.14
140.0	-.50	-.32	.21	.32	-.02	-.39	-.27	.15
145.0	-.33	.42	-.36	.06	.17	-.40	.24	-.14
150.0	-.44	.39	-.27	-.15	.32	-.33	.04	.19
155.0	.27	.37	-.03	-.43	-.31	.11	.32	.11
160.0	.21	-.05	-.30	-.44	-.38	-.25	-.02	.18
165.0	.35	-.47	.35	-.47	.35	-.39	.28	-.31
170.0	-.14	-.43	-.50	-.35	-.10	.14	.29	.30
175.0	-.01	.34	-.45	.13	.16	-.42	.23	-.01
180.0	.35	.41	.09	-.31	-.44	-.21	.14	.31

PATTERN DEGRADATION IN (DB)

FREQUENCY 387.400 MHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	1.10 KM	1.20 KM	1.30 KM	1.40 KM	1.50 KM	1.60 KM	1.70 KM	1.80 KM
ANGLE	0.59 NM	0.64 NM	0.70 NM	0.75 NM	0.81 NM	0.86 NM	0.91 NM	0.97 NM
.0	-1.10	-.40	.21	.60	.78	.80	.70	.53
5.0	-.36	.28	-.24	.17	-.14	.08	-.06	.00
10.0	.17	.11	.03	-.03	-.08	-.14	-.18	-.22
15.0	.26	-.19	-.07	.15	-.30	.20	-.17	-.04
20.0	-.32	-.22	.13	.20	-.06	-.27	-.13	.13
25.0	-.15	-.27	-.29	-.20	-.05	.08	.16	.14
30.0	.22	.03	-.31	.09	.11	-.27	.00	.15
35.0	.17	.00	-.24	.20	-.15	-.10	.16	-.24
40.0	-.14	.23	.11	-.23	-.23	.10	.16	-.13
45.0	.13	-.18	-.33	-.22	.03	.19	.16	.00
50.0	-.26	.02	.22	.20	-.03	-.25	-.26	-.06
55.0	-.29	-.38	-.29	-.16	.04	.16	.21	.16
60.0	-.28	.29	-.33	.09	.06	-.27	.20	-.21
65.0	.01	-.27	.28	-.30	.06	.07	-.28	.21
70.0	.00	.04	.07	.11	.14	.17	.19	.20
75.0	-.41	.00	.31	.05	-.32	-.20	.14	.19
80.0	.37	.03	-.39	-.21	.20	.21	-.14	-.32
85.0	-.42	-.32	-.21	-.12	-.06	.04	.10	.15
90.0	.13	.35	-.02	-.39	-.16	.23	.16	-.23
95.0	.05	-.16	.13	-.19	.16	-.25	.18	-.27
100.0	-.13	-.32	.34	-.18	-.24	.29	-.18	-.20
105.0	-.29	.38	-.22	-.23	.31	-.18	-.22	.27
110.0	.09	-.36	.35	-.39	.21	-.12	-.11	.18
115.0	-.40	.07	.35	.24	-.11	-.34	-.29	.02
120.0	.43	.23	-.18	-.44	-.25	.11	.29	.17
125.0	-.11	-.39	.36	-.13	-.29	.31	-.18	-.17
130.0	-.33	-.35	.30	.10	-.42	.02	.28	-.23
135.0	-.55	.35	-.20	-.11	.24	-.41	.27	-.19
140.0	.44	.00	-.43	-.26	.23	.28	-.14	-.39
145.0	-.17	-.35	-.43	-.46	-.37	-.22	-.04	.12
150.0	-.08	.25	.39	.27	-.03	-.32	-.40	-.23
155.0	.21	.20	-.46	.17	.16	-.39	.18	.10
160.0	.28	.10	-.46	.27	-.04	-.35	.30	-.12
165.0	-.28	-.36	-.40	-.44	-.42	-.38	-.36	-.29
170.0	.38	-.48	.38	-.46	.35	-.42	.32	-.39
175.0	.02	.14	.26	.28	.34	.33	.31	.26
180.0	-.40	.36	-.50	.34	-.36	.18	-.13	-.05

Appendix D: Numerical Results - 0.212 GHz to 13.35 GHz Data

PATTERN DEGRADATION IN (DB)

FREQUENCY .212 GHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-7.21	-2.06	-1.82	-4.51	-9.99	-5.46	-3.10	-2.36
5.0	-3.04	-1.09	.28	.75	-.12	.31	.17	-.15
10.0	1.87	.41	-.59	-.46	-.25	.16	.08	.04
15.0	1.37	.57	-.18	-.44	-.23	.07	.06	-.10
20.0	-1.10	.34	.32	-.08	-.10	-.11	.03	.03
25.0	-.96	.08	.32	.27	.08	-.04	-.01	.00
30.0	.86	.01	-.21	.27	.07	-.01	.01	.03
35.0	.65	.36	-.41	.17	-.04	-.14	.09	-.07
40.0	.13	.14	-.31	.30	-.22	-.08	.08	.05
45.0	.94	.42	.10	-.17	-.22	-.05	.05	-.04
50.0	.11	.48	-.09	-.32	.22	-.01	-.03	.06
55.0	.34	.24	-.32	.29	-.18	-.05	.08	.07
60.0	-.59	-.29	-.11	.10	-.13	-.16	.03	.06
65.0	.40	.11	-.17	.17	-.26	.16	.01	-.07
70.0	.57	-.13	-.05	.23	.17	-.04	.08	.08
75.0	.09	.55	.31	-.28	-.28	.00	-.01	.02
80.0	-1.33	-.04	.45	-.16	-.11	-.11	.04	.01
85.0	-.31	.54	-.50	.13	-.06	-.01	.06	.08
90.0	.59	-.14	-.45	-.37	-.08	.18	-.08	.01
95.0	1.13	-.29	-.12	.37	-.07	-.01	-.09	-.07
100.0	1.22	.54	.35	.24	.07	-.09	-.11	-.02
105.0	-.11	.03	.14	.23	.31	-.11	.11	.03
110.0	-1.03	.64	-.01	-.41	-.31	-.19	-.11	-.07
115.0	.97	-.41	-.49	.06	.04	.02	-.03	-.05
120.0	.99	-.36	-.58	.04	-.33	.19	.11	.03
125.0	.90	.69	.12	-.35	-.21	.14	.14	.10
130.0	1.07	-.53	.41	-.33	.30	-.20	-.06	.07
135.0	-.03	-.66	-.58	-.08	.30	.00	.15	.02
140.0	-.30	.70	-.11	.00	.26	.11	-.04	.02
145.0	1.33	.41	.06	-.16	.28	.20	-.09	-.04
150.0	1.07	.74	.39	-.04	-.08	-.22	-.04	.10
155.0	1.19	-.19	-.15	.33	.17	-.02	-.13	-.01
160.0	.81	-.31	.35	-.24	-.13	-.15	-.02	.10
165.0	1.46	.71	.53	.23	-.22	.04	-.08	-.10
170.0	.03	-.40	-.49	-.47	.35	.14	-.14	-.03
175.0	1.44	-.79	.61	-.48	.28	-.10	.08	-.02
180.0	-.33	-.64	.44	.19	-.37	.20	-.05	-.09

PATTERN DEGRADATION IN (DB)

FREQUENCY .424 GHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-9.60	-3.55	-3.97	-.73	.50	-1.61	.50	1.36
5.0	-2.73	1.16	-.45	-.09	-.36	-.34	.27	-.24
10.0	-1.45	-.13	.27	-.29	.20	.14	.09	.05
15.0	-.98	-.23	.32	-.34	-.01	.14	.07	-.06
20.0	-.47	-.06	-.06	.20	.14	-.04	.06	.08
25.0	-.36	.31	-.26	-.18	.11	.08	.07	.07
30.0	-.04	.37	-.02	-.26	.20	.15	.07	.05
35.0	.50	-.13	-.32	.20	.17	-.13	-.08	-.04
40.0	.87	.46	-.06	-.30	-.16	.09	-.04	.02
45.0	-.92	-.23	.33	.14	-.17	.13	.05	.03
50.0	.95	-.30	.32	-.32	-.13	.17	.07	-.01
55.0	.93	.24	.01	-.16	-.01	.15	-.01	-.03
60.0	.40	.13	.38	.32	.09	-.17	.09	-.01
65.0	.92	.46	.34	.26	-.22	-.14	.11	-.06
70.0	.71	.41	.43	.07	.09	.18	-.02	-.05
75.0	1.13	-.28	.20	-.09	-.26	.20	.12	.07
80.0	-1.24	.53	-.47	.24	.18	-.02	.09	.09
85.0	1.00	-.12	-.38	.37	.26	.21	.06	-.05
90.0	.91	.59	-.28	-.28	.26	-.20	.01	.10
95.0	-.61	.36	.39	-.32	.27	.20	-.08	-.05
100.0	-1.06	-.02	.05	.13	.25	.16	-.13	.09
105.0	1.25	.64	.46	[illegible]7	-.29	.02	-.06	.08
110.0	-.01	-.58	.53	[illegible]2	-.28	-.22	-.11	.00
115.0	.25	.10	-.38	.47	.31	.23	.11	.03
120.0	.37	.43	-.44	.46	-.31	-.19	-.02	.08
125.0	.64	-.61	.48	-.01	.02	-.04	-.12	-.10
130.0	.05	.13	-.04	-.11	-.12	-.24	.10	.02
135.0	1.34	-.24	-.35	.48	-.14	.23	-.14	.10
140.0	1.19	-.52	-.10	.49	.02	.07	.10	.10
145.0	-.93	.32	.54	.42	-.02	-.21	.07	.06
150.0	.35	-.77	.05	.50	.26	-.20	.14	-.10
155.0	-.21	.60	.54	.11	.24	.22	-.14	.12
160.0	.98	.38	.36	.31	.19	.09	.12	-.09
165.0	-1.58	-.72	-.14	.25	.01	.21	.06	-.11
170.0	1.40	.44	-.22	-.51	-.27	.13	-.11	.10
175.0	-1.33	-.75	-.59	-.53	-.02	.08	.09	.09
180.0	1.15	-.30	-.12	.34	-.33	-.05	.07	-.05

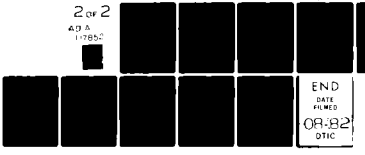
PATTERN DEGRADATION IN (DB)

FREQUENCY .899 GHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-13.76	-8.35	-4.59	-.96	-.37	.45	-1.25	.33
5.0	-1.25	-.43	.57	-.40	.09	-.21	.04	.11
10.0	-1.33	.03	-.25	.34	-.25	-.13	.07	.11
15.0	-.80	.15	-.25	.24	.08	-.13	.02	.09
20.0	.37	-.20	.18	.21	.16	-.11	.06	.00
25.0	.05	.28	-.19	-.18	-.18	-.13	-.02	.04
30.0	.07	.33	-.20	.17	-.15	.11	.08	.07
35.0	-.03	-.41	.08	.20	.09	.04	.09	-.03
40.0	-.47	.03	.17	-.20	.10	-.04	-.11	.04
45.0	.46	.46	-.29	.20	.12	.00	.10	.00
50.0	-.64	-.32	.35	-.05	-.21	.05	-.12	-.03
55.0	.88	.11	.10	-.24	.19	-.15	-.13	-.07
60.0	-.98	.49	.21	-.24	.26	-.05	.06	-.07
65.0	-.89	-.59	.32	-.10	-.05	-.17	.06	.04
70.0	.34	.38	.01	-.18	.04	.18	-.11	.04
75.0	.74	-.40	.36	.28	-.29	-.09	.12	-.11
80.0	.87	-.08	-.29	.36	.26	.17	.13	.08
85.0	.67	.28	.47	.14	-.27	-.08	.09	-.06
90.0	.44	.22	.13	-.32	.20	-.17	-.14	-.11
95.0	.50	-.44	-.34	-.23	.00	.18	-.03	-.05
100.0	-.63	-.28	.35	.39	-.27	-.11	.07	.12
105.0	.63	-.72	.42	-.28	.02	.21	-.14	.09
110.0	.76	-.32	-.40	.37	-.08	.22	-.16	.10
115.0	-1.27	.54	.45	-.06	.10	.18	.10	-.08
120.0	.32	.58	-.56	.42	.30	-.01	-.08	.10
125.0	1.26	-.66	.22	.16	-.32	.22	.16	.11
130.0	1.20	.56	.06	-.27	.33	-.23	-.09	.06
135.0	-.31	-.59	.37	.32	.33	-.18	.16	-.04
140.0	.39	-.76	-.04	.44	.34	.00	-.12	.11
145.0	.71	-.24	.09	.09	.31	-.03	.13	-.12
150.0	.34	-.78	.28	.35	-.24	.21	.15	.07
155.0	-1.58	-.63	-.33	-.15	.20	.15	.14	.11
160.0	.92	.53	.43	.37	.02	.23	-.20	.15
165.0	.30	-.46	.53	-.47	.19	-.23	-.1[illegible]	.07
170.0	.12	.38	-.47	.45	.29	-.02	-.15	.14
175.0	-1.52	-.57	.21	.48	.29	.04	-.18	.02
180.0	-.74	.64	.36	-.39	.26	.12	-.01	-.06

AD-A117 852 NAVAL OCEAN SYSTEMS CENTER SAN DIEGO CA F/G 20/14
EMI EVALUATION OF SESEF.(U)
FEB 82 S T LI, J C LOGAN, D W TAM
UNCLASSIFIED NOSC/TR-762 NL

2 OF 2
AD A 117852



PATTERN DEGRADATION IN (DB)

FREQUENCY 1.050 GHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-13.57	-5.40	-6.32	.42	.62	.86	-1.51	-.07
5.0	-.39	-.09	.12	.16	-.27	.12	-.09	-.03
10.0	.60	-.18	.12	.21	-.09	-.04	-.11	-.08
15.0	-.82	.28	-.25	-.17	-.06	-.08	-.02	.05
20.0	.56	.04	.27	-.17	-.13	.11	.08	-.02
25.0	-.07	-.11	.26	-.23	-.13	.09	-.09	.04
30.0	.76	-.15	.31	.01	.19	-.12	-.01	-.03
35.0	-.66	.19	.21	.20	-.19	-.04	.12	-.10
40.0	-.79	.17	-.31	-.16	.02	-.15	.05	.04
45.0	-.26	-.30	-.17	.28	.15	-.16	.09	.05
50.0	.75	.46	-.14	-.24	-.06	.12	-.02	-.01
55.0	-.58	-.18	-.16	-.15	.13	.10	.09	.12
60.0	.10	.01	.37	-.25	-.19	.17	.04	-.05
65.0	.15	-.52	.17	.14	.24	-.16	-.12	-.02
70.0	.85	.48	.06	-.34	.23	.16	.07	.00
75.0	-1.26	.55	-.10	-.36	-.19	.06	.12	-.10
80.0	.72	.29	.42	-.10	-.27	.19	.11	.03
85.0	-.23	-.52	-.12	.18	.28	-.05	.14	-.09
90.0	.84	-.32	.46	-.04	.17	.20	-.09	-.04
95.0	1.15	.40	-.45	-.13	-.19	-.03	-.12	.10
100.0	1.03	.56	.03	-.32	.29	.04	-.10	.11
105.0	.03	.11	.39	-.41	-.29	-.01	.13	-.12
110.0	.13	-.28	.06	.23	.17	.04	.15	-.04
115.0	1.18	-.66	-.23	.37	-.09	.18	-.07	.01
120.0	1.32	.67	.47	.28	.07	.22	-.17	.13
125.0	1.03	.37	-.51	.39	-.03	.20	.04	-.12
130.0	-.04	-.19	-.48	-.45	-.01	-.04	-.10	-.11
135.0	1.37	-.43	-.33	.43	.30	.21	.17	.15
140.0	1.37	-.73	.28	.12	.06	.20	.05	-.13
145.0	1.35	-.37	.10	.18	-.21	-.25	.03	.11
150.0	.82	-.76	.29	.23	-.32	-.14	.20	-.15
155.0	-1.65	-.75	-.58	-.46	.14	-.24	-.06	.10
160.0	.60	.53	.55	.44	-.15	.18	-.12	.07
165.0	-.37	-.39	.56	-.32	.21	.16	.13	.08
170.0	1.21	-.64	.49	-.44	.11	-.24	.19	-.16
175.0	1.41	-.68	.43	-.17	.21	.15	.16	.11
180.0	.10	-.18	.29	-.37	-.33	.16	-.18	.06

PATTERN DEGRADATION IN (DB)

FREQUENCY 1.320 GHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-15.94	-9.33	-5.16	.38	-.95	.42	-1.60	-.59
5.0	.10	.20	.28	.25	.18	-.08	-.12	-.07
10.0	-.88	.30	.18	.20	-.04	-.12	.11	-.15
15.0	-.47	.00	-.15	-.15	-.12	-.04	-.03	.04
20.0	-.68	-.26	.11	.11	-.08	-.04	-.12	-.05
25.0	.69	.30	.06	-.25	.19	.12	.09	-.07
30.0	-.57	.07	-.18	-.22	-.16	.04	.02	-.12
35.0	.01	.39	.20	-.06	.20	-.15	-.05	-.09
40.0	.64	-.31	-.12	-.12	-.16	-.12	.13	-.12
45.0	-.63	.46	.08	-.19	.03	-.15	.14	-.11
50.0	.17	.39	.25	-.11	-.22	.13	-.05	-.06
55.0	.75	.41	.33	-.15	.17	.16	.06	-.05
60.0	-.94	-.47	.11	.06	-.02	-.01	.09	.11
65.0	-1.10	-.20	-.07	.33	.15	-.14	-.14	-.07
70.0	1.04	-.23	.01	.24	.26	.13	-.12	.14
75.0	-.51	-.22	-.08	-.11	.00	-.14	-.13	.03
80.0	-.36	-.63	.43	-.40	.25	.10	-.04	-.12
85.0	-1.06	.59	.08	-.39	.14	-.15	-.14	-.02
90.0	.16	.37	-.13	-.33	-.18	-.06	.11	.12
95.0	1.18	-.12	-.12	-.05	-.29	.20	.01	-.09
100.0	-1.37	-.69	-.03	.43	-.20	.13	-.08	.06
105.0	-1.40	.64	.07	-.43	.13	-.20	.16	-.13
110.0	-.60	.39	.23	-.45	-.31	-.17	-.03	.10
115.0	.68	.23	.45	.41	.28	-.19	.17	-.08
120.0	-.84	.47	.18	-.43	.23	.01	-.16	.04
125.0	1.08	-.25	.29	-.37	.30	.23	.19	.11
130.0	-.27	.39	.40	.39	-.21	.16	.16	.10
135.0	-.90	-.77	-.48	-.27	.16	-.03	-.11	-.17
140.0	-.16	-.71	.15	.47	.34	.20	.05	-.06
145.0	-.62	.19	.36	.42	.28	-.26	.00	.13
150.0	-.25	.58	.51	.20	.35	-.18	.11	.04
155.0	-1.61	-.77	-.56	-.36	.16	-.04	-.15	-.10
160.0	-.54	.37	.55	.30	-.07	.12	.14	.04
165.0	1.04	-.33	-.57	-.13	-.24	-.24	-.09	.12
170.0	1.29	-.33	-.52	.22	-.27	.06	-.18	-.13
175.0	.34	-.71	-.38	.27	-.35	.16	-.22	-.02
180.0	-1.24	.18	.54	.35	.33	.21	-.23	-.01

PATTERN DEGRADATION IN (DB)

FREQUENCY 3.000 GHZ DRILL TOWER HEIGHT 73.400 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-18.54	-10.91	-7.11	-1.00	-1.09	-1.55	1.70	-1.85
5.0	1.53	.48	.07	-.29	-.06	-.13	.41	.57
10.0	.75	.15	-.27	.14	.29	.04	.37	.57
15.0	-.64	-.30	-.28	.00	-.02	-.29	.26	.54
20.0	-.67	.16	.27	.22	-.07	-.26	.06	.59
25.0	-.44	-.29	-.17	.11	.05	-.17	.29	.15
30.0	-.05	-.25	-.21	.00	-.05	-.13	.30	.66
35.0	-.84	.32	.19	-.14	.01	-.04	.28	.50
40.0	-.90	-.26	.14	.26	.08	-.07	-.14	.13
45.0	-.97	-.39	-.16	.20	.07	.01	-.31	.54
50.0	.82	.34	-.20	-.20	.11	-.02	.03	.43
55.0	-.50	-.31	-.27	-.36	-.21	.34	-.28	.25
60.0	.23	.19	.39	.32	-.25	-.03	.01	.19
65.0	1.00	-.32	-.40	.18	-.21	.12	-.18	-.26
70.0	.53	-.54	-.11	.36	.00	.16	.04	-.11
75.0	1.01	.04	.13	.09	.19	.15	.09	-.06
80.0	1.04	.56	-.27	-.25	-.25	.16	.13	.16
85.0	-1.29	.29	-.52	.28	-.24	.18	.12	.10
90.0	.56	.31	.30	.21	.28	.16	-.14	.04
95.0	-.02	-.30	.51	-.26	-.07	.14	.07	-.14
100.0	.31	.64	-.20	-.26	.05	-.18	-.02	.09
105.0	1.25	-.59	-.48	-.34	-.35	-.04	.17	.07
110.0	1.21	-.63	.11	.45	-.34	-.28	-.06	-.29
115.0	-.43	.61	.32	-.36	-.23	-.03	-.20	.18
120.0	-.24	.65	.45	.17	-.31	-.02	-.13	-.01
125.0	-.22	.67	.50	.37	-.33	.20	-.33	.47
130.0	1.04	-.46	-.44	.32	-.24	.20	-.16	.35
135.0	-.13	.66	.08	-.42	-.36	.20	-.20	.05
140.0	-.08	.57	-.23	-.51	.24	-.15	-.05	.60
145.0	-.79	.04	.58	.22	-.05	-.29	.49	-.06
150.0	1.38	.51	.26	-.01	.39	-.08	.47	.43
155.0	1.39	.43	-.10	-.45	.37	-.26	.16	-.10
160.0	-.97	-.64	-.62	-.38	.42	-.30	.24	.42
165.0	.41	-.58	-.62	-.21	.25	.14	.23	.63
170.0	1.29	-.58	.32	-.23	-.23	.08	.21	.46
175.0	1.14	.40	-.57	-.08	.40	-.40	.18	-.03
180.0	.59	.69	.44	.00	.42	.00	.45	-.10

PATTERN DEGRADATION IN (DB)

FREQUENCY 3.500 GHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-23.10	-19.47	-7.00	-.51	-1.09	1.61	.29	-.89
5.0	1.71	-.14	.12	.29	.08	.51	.01	-.13
10.0	.60	-.19	-.15	-.06	.09	-.07	.04	-.09
15.0	.49	-.22	-.04	.17	.13	-.02	-.09	.79
20.0	-.24	.33	.25	.04	.33	.47	-.10	-.06
25.0	.40	.00	-.13	-.07	-.17	.06	.78	-.06
30.0	.59	.09	.13	.15	.24	.24	.34	.05
35.0	.32	-.10	.27	-.05	-.09	.27	.33	.06
40.0	.59	.17	.29	-.26	-.04	.16	.43	-.03
45.0	.42	.05	.27	-.29	.28	.26	.34	-.14
50.0	.55	.35	.16	.22	.12	.23	.44	-.07
55.0	-.31	-.52	.23	-.06	-.21	.15	.04	-.12
60.0	-.42	-.36	-.18	.19	.14	.26	-.05	-.01
65.0	-.81	-.27	-.06	.33	-.26	.18	.21	-.12
70.0	-1.19	.37	.10	-.10	-.14	-.09	.21	-.02
75.0	-1.29	-.38	.25	.36	.26	-.10	.05	.11
80.0	1.15	.05	-.20	-.38	.19	.03	-.19	.17
85.0	.46	-.61	-.51	-.33	.05	.07	.19	.10
90.0	-.88	.58	.00	-.25	-.11	.02	-.03	-.05
95.0	-.02	-.44	.15	.25	.29	-.17	-.12	-.13
100.0	-1.42	-.61	.47	-.41	-.32	-.11	-.20	.08
105.0	1.24	.05	.43	.39	-.07	.15	.04	.29
110.0	-.65	.56	-.25	-.27	-.12	-.10	.16	.35
115.0	1.04	.70	-.59	.28	.02	.15	.38	.02
120.0	1.14	.47	-.22	-.16	-.27	.07	.16	-.20
125.0	.07	-.21	.55	-.13	-.24	.05	.15	-.11
130.0	-.17	.46	.34	-.44	-.17	.10	-.15	.07
135.0	.25	.70	.58	.42	.49	.14	.11	.84
140.0	-.06	.68	-.33	.13	.43	.11	-.22	.15
145.0	-.61	.68	-.36	.12	.39	.27	.34	.00
150.0	-1.21	.61	-.21	-.24	-.09	.09	.49	-.04
155.0	1.13	-.10	-.46	.37	-.05	.14	.69	.00
160.0	.84	-.60	.62	-.42	.49	.51	-.23	.11
165.0	-1.66	.76	-.57	.32	-.01	.57	-.14	.73
170.0	.83	-.72	.56	-.06	.14	.16	-.23	.15
175.0	-.26	.23	-.01	-.06	.09	.23	-.17	.08
180.0	1.42	.50	-.15	-.52	.50	.18	.13	.07

PATTERN DEGRADATION IN (DB)

FREQUENCY 5.650 GHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-21.32	-17.84	-9.75	.29	-.18	.37	-1.29	-1.71
5.0	.23	.31	.25	-.08	-.03	-.03	.04	.09
10.0	-.50	-.29	.09	.09	-.03	.10	.12	.05
15.0	.53	-.30	.26	.18	-.07	.03	.10	.00
20.0	-.50	-.28	.29	-.10	.21	.14	.09	.01
25.0	.12	-.34	.22	.08	.18	.15	.14	.11
30.0	.60	-.36	.24	-.20	-.08	.05	.08	.08
35.0	-.77	.33	-.30	.15	-.01	.03	.04	.06
40.0	-.63	-.28	.27	.32	-.16	-.05	.17	-.01
45.0	.69	-.01	-.27	-.24	.18	-.05	.00	.14
50.0	-.85	-.09	.32	-.03	-.18	.19	.02	-.02
55.0	-.30	-.37	.02	.35	.29	.17	-.07	.06
60.0	-.92	-.53	.13	.37	.04	-.01	-.07	.13
65.0	.22	.11	.27	-.16	-.18	-.10	-.04	.05
70.0	.76	-.24	.37	.35	-.22	-.04	.13	.02
75.0	.56	.12	-.05	-.28	-.16	-.12	.20	-.06
80.0	.54	.28	-.43	.40	-.30	-.04	.20	-.05
85.0	1.11	-.35	.45	.15	-.20	-.10	.18	-.07
90.0	.13	.19	-.48	-.18	.23	.13	-.02	-.07
95.0	.79	-.65	-.13	.24	-.31	.02	.14	-.07
100.0	-1.38	-.46	-.17	.25	-.33	.08	-.06	-.07
105.0	1.14	.48	.49	.40	.17	-.15	.11	.17
110.0	-.03	.33	.30	-.36	.09	-.15	.13	.14
115.0	1.23	.70	.17	-.27	.28	-.10	-.13	-.06
120.0	1.22	.62	.27	-.23	.27	.25	.21	.12
125.0	.80	.67	.07	-.37	.09	.18	.23	.16
130.0	-1.25	-.62	-.33	.37	.26	.08	-.01	-.05
135.0	.18	-.81	.45	.08	-.22	-.02	.11	.01
140.0	.55	-.68	.06	.44	-.31	.01	-.41	-.06
145.0	-1.08	-.17	.33	.47	.32	.17	-.06	-.09
150.0	.29	-.73	-.50	-.44	.23	-.14	-.07	.15
155.0	1.37	.16	-.19	-.26	-.28	.27	.13	-.03
160.0	-.79	-.67	-.39	-.25	-.22	.19	.19	.16
165.0	-.84	.55	.55	.04	.10	.26	-.13	.11
170.0	-.47	.53	.57	.02	.01	.07	.08	.05
175.0	-1.25	.00	.51	-.43	-.04	.28	-.03	-.01
180.0	-.53	.58	.52	-.10	.40	-.14	.12	.19

PATTERN DEGRADATION IN (DB)

FREQUENCY 8.550 GHZ DRILL TOWER HEIGHT 73.460 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-25.47	-17.18	-13.56	.03	.17	-.43	-.46	.52
5.0	-1.17	.24	.20	-.23	-.04	-.08	-.04	.00
10.0	.29	.15	-.01	.16	.10	-.08	-.06	-.09
15.0	-.56	.20	.18	-.16	.11	-.07	-.07	-.04
20.0	-.04	-.20	.07	-.20	.00	.10	-.01	-.07
25.0	-.69	-.10	-.19	.05	-.12	-.08	.06	.03
30.0	-.75	.34	.09	.16	-.16	-.01	.05	-.07
35.0	-.83	.19	.30	.22	-.16	.11	.02	-.01
40.0	-.88	-.33	.12	-.11	-.17	.14	-.04	-.04
45.0	.01	.09	-.02	.28	.19	-.13	-.03	.02
50.0	-.65	-.42	-.30	-.32	.14	.15	-.05	-.04
55.0	.22	-.52	-.39	-.01	.22	.11	.00	-.06
60.0	-1.03	-.54	.40	.10	-.23	.14	-.12	.08
65.0	.96	.17	.21	-.10	-.03	-.04	-.02	.01
70.0	.92	.55	.09	-.13	.21	-.13	.04	.00
75.0	.98	.30	.42	-.11	-.20	.12	.11	.11
80.0	.14	-.58	-.41	-.40	-.16	.05	-.14	-.01
85.0	.35	.15	-.17	.10	-.07	.01	.14	.02
90.0	.75	.61	-.28	-.41	.26	-.18	-.04	.08
95.0	1.21	-.05	.43	-.35	.17	-.20	.14	-.12
100.0	-1.22	-.42	.03	-.13	-.09	-.21	.14	-.10
105.0	-1.17	-.61	-.50	.21	.23	.09	.07	-.12
110.0	-.52	-.69	-.50	-.13	-.17	-.08	.06	.11
115.0	1.05	-.72	.34	.33	-.31	.07	-.16	.06
120.0	-1.55	-.37	.48	.34	-.25	-.22	.09	.08
125.0	.76	-.38	-.44	.42	.18	.00	-.14	-.11
130.0	-.50	.48	-.49	.37	.24	-.22	.14	-.01
135.0	-1.58	-.09	-.58	-.23	-.32	.18	-.03	-.13
140.0	1.13	-.74	-.47	-.13	.02	.21	-.04	-.05
145.0	-.63	-.75	.51	-.42	.25	-.23	-.12	.03
150.0	-.98	.62	-.54	.46	-.33	-.24	-.13	-.04
155.0	.57	.31	.56	.17	-.32	-.03	-.01	.03
160.0	1.37	-.29	-.60	-.29	.16	.10	.03	-.02
165.0	-1.24	-.55	.48	.14	.19	.11	.05	-.13
170.0	-1.60	-.46	.20	.45	.09	-.24	.09	.02
175.0	1.41	.00	-.60	.18	-.06	-.23	.07	.09
180.0	-1.68	-.36	.30	.47	-.32	-.13	.13	.06

PATTERN DEGRADATION IN (DB)

FREQUENCY 9.300 GHZ DRILL TOWER HEIGHT 73.400 METERS

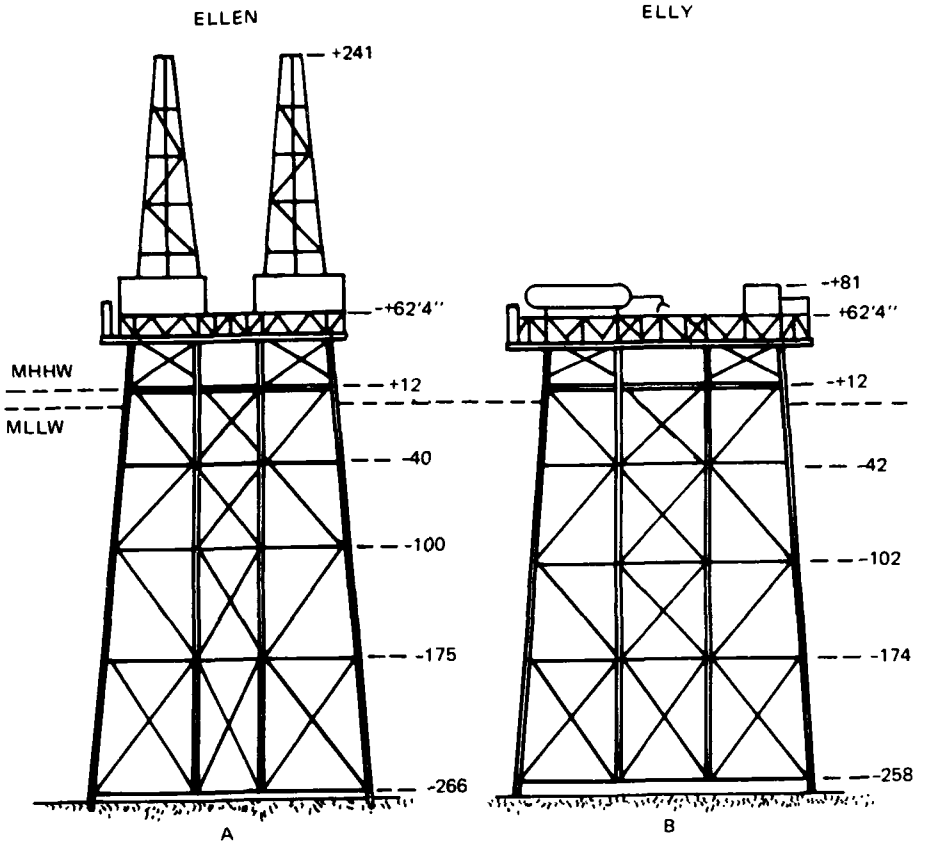
	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-25.21	-16.02	-13.70	-.18	-.26	.12	-.45	.27
5.0	-.61	-.07	-.21	-.09	-.15	-.06	-.15	.02
10.0	-.54	-.26	-.01	-.13	-.11	.11	-.03	.30
15.0	-.56	-.17	.14	-.03	-.14	.00	-.15	.01
20.0	-.62	-.31	.13	.09	-.04	.08	-.16	.06
25.0	.15	-.31	.23	-.16	.04	-.03	-.15	.06
30.0	-.64	-.18	-.25	.12	.17	.18	-.12	.01
35.0	.76	.36	-.29	-.19	-.09	-.13	.00	.16
40.0	.81	-.33	.23	.09	-.22	-.02	-.08	.07
45.0	.04	-.11	-.33	.19	.13	.01	-.19	.10
50.0	-1.02	.03	.30	-.04	-.08	-.05	-.17	-.17
55.0	.46	.18	.16	-.32	-.26	.18	.03	-.01
60.0	-.01	-.31	-.32	-.31	.24	-.04	.12	.01
65.0	-1.09	-.25	-.35	.09	.08	.11	.18	-.05
70.0	-1.22	.55	.42	-.10	-.21	-.18	-.03	.03
75.0	1.04	.57	-.33	.37	-.07	.05	-.02	.02
80.0	.74	.54	.44	.14	-.15	.11	-.10	.03
85.0	.41	-.15	-.17	.29	-.29	.16	.08	.04
90.0	1.18	.24	-.19	-.28	.27	.02	-.14	-.04
95.0	-.50	.25	-.49	.31	23	.15	-.03	.03
100.0	.81	-.68	-.11	.36	.05	-.06	.01	.00
105.0	-1.46	.60	.25	.26	.22	.14	-.14	.18
110.0	-1.32	-.70	-.01	.39	-.24	.06	.04	-.04
115.0	.61	-.57	-.05	.25	.03	.14	.04	-.22
120.0	-1.42	.67	-.54	.41	.17	-.23	.13	.00
125.0	-1.54	.66	.14	-.44	.24	-.05	-.01	-.09
130.0	-.13	-.64	.21	.01	.18	.18	-.09	-.15
135.0	-1.30	.36	.26	.31	-.02	-.14	-.10	.18
140.0	1.22	.50	-.36	.19	-.30	.25	.07	.29
145.0	-.98	.17	-.55	-.25	.31	-.16	-.25	.05
150.0	1.39	.07	.07	.12	-.31	.14	-.25	-.01
155.0	1.30	-.42	-.56	-.47	.25	.05	-.24	.13
160.0	.75	-.38	-.02	.35	.32	.24	-.23	.02
165.0	1.38	-.43	-.46	.27	.29	.00	-.09	.03
170.0	-.50	.52	-.43	.41	-.09	.27	-.23	.32
175.0	1.17	-.38	.19	.02	.27	.15	-.07	-.04
180.0	-.63	.27	.53	.45	.17	-.09	-.08	.13

PATTERN DEGRADATION IN (DB)

FREQUENCY 13.350 GHZ DRILL TOWER HEIGHT 73.400 METERS

	DISTANCE FROM BUOY TO DRILLING PLATFORM							
	0.10 KM	0.40 KM	0.70 KM	1.00 KM	2.00 KM	4.00 KM	8.00 KM	12.0 KM
ANGLE	0.05 NM	0.22 NM	0.38 NM	0.54 NM	1.08 NM	2.16 NM	4.32 NM	6.48 NM
.0	-26.71	-14.43	-12.74	.14	-1.90	-2.36	-6.48	3.56
5.0	.64	-.22	.33	-.20	.50	-.74	-3.60	4.35
10.0	-.52	.20	.05	.03	.45	-.75	-3.42	4.36
15.0	.37	-.17	.19	.25	-.59	-3.38	1.36	-3.58
20.0	-.54	.27	.11	-.24	.36	-.59	-3.38	1.45
25.0	-.18	.36	-.07	.02	.02	-1.88	-.67	-3.60
30.0	.10	.34	-.27	.36	.03	-2.13	-.63	1.37
35.0	.28	.18	-.44	-.05	.07	-2.04	-.77	1.45
40.0	.46	-.45	.47	.13	.53	-.76	-3.62	1.31
45.0	-.87	-.30	.21	-.32	-.01	-.80	-3.35	-3.64
50.0	.90	-.14	.27	-.11	-.21	.37	-.73	-3.54
55.0	.87	.47	.02	.46	.06	.54	-.74	-3.65
60.0	.84	.52	.41	-.09	.12	.48	-.81	-.80
65.0	1.01	-.19	-.20	.12	-.35	.47	-.58	-.71
70.0	.88	-.31	-.39	.43	.05	.33	-.60	-.61
75.0	.48	.55	-.37	.19	.15	-.17	.30	-1.86
80.0	1.14	.55	-.13	.35	.40	-.16	.45	-.78
85.0	-1.33	-.54	-.22	.36	-.28	.13	-.20	-.02
90.0	-.49	.31	-.03	.36	-.19	-.15	.14	-.03
95.0	-1.11	.23	-.50	-.45	-.22	.05	.01	-.07
100.0	-.31	-.62	.42	.34	.17	.35	-.09	.27
105.0	.68	.14	-.21	-.06	-.01	.55	-.57	-1.87
110.0	-.27	.57	.07	-.36	.45	.09	.55	-.53
115.0	.99	.31	-.31	.42	-.27	.60	-2.14	-.62
120.0	.62	.10	.62	.57	.01	.21	-.53	-3.68
125.0	-1.53	.31	-.17	.56	-.06	.62	-.89	-.52
130.0	-.80	-.44	-.36	-.60	.73	-.52	-3.69	-3.41
135.0	1.18	-.66	-.56	.15	.10	-.64	-3.71	-3.35
140.0	-1.63	.37	-.67	.58	-.46	-2.27	-.83	-3.34
145.0	-1.44	-.66	.67	-.59	-.43	-1.89	-3.51	-3.67
150.0	-1.69	.27	-.20	-.20	.04	-1.94	-.82	1.24
155.0	-.55	-.12	.72	-.06	-.46	-1.95	-.74	-3.27
160.0	.03	-.68	-.73	-.62	.14	-.69	-3.25	1.28
165.0	-1.56	.47	.22	-.56	.29	-3.27	-3.26	1.52
170.0	.79	.65	-.29	-.44	.07	-.48	-3.64	4.33
175.0	1.42	.44	-.30	-.61	.33	-3.13	-3.67	1.43
180.0	-.63	-.49	.43	.81	-.66	-3.84	-3.43	4.41

Appendix E: Platform Ellen and Elly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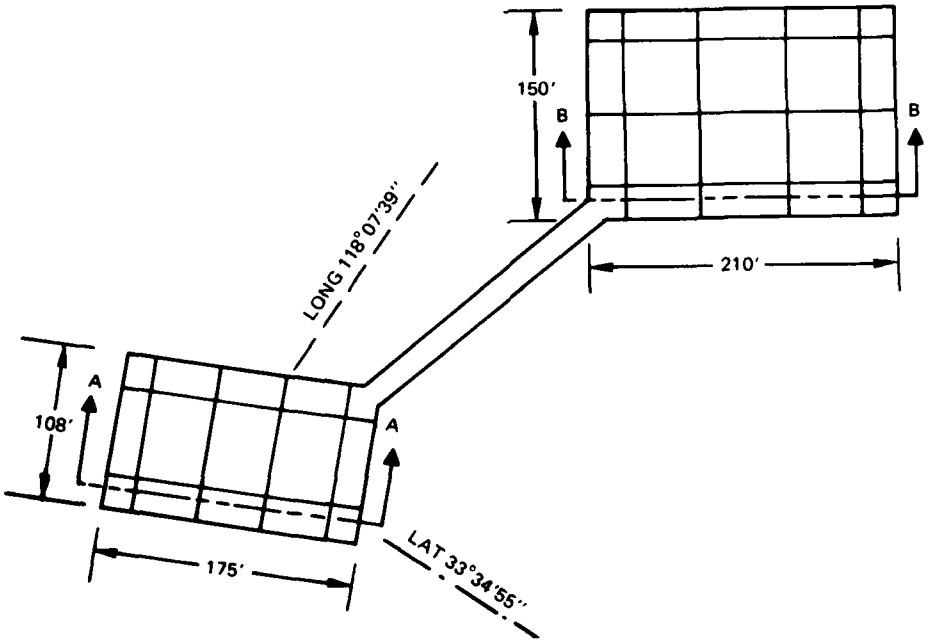
MHHW
MLLW
+12
-40
-100
-175
-266
A
-+81
+62'4"
-+12
-42
-102
-174
-258
B


150'
B
B
LONG 118°07'39"
210'
108'
A
A
175'
LAT 33°34'55"

Appendix F. SESEF Frequency Assignments[1-2]

1. Long Beach Naval Shipyard, Code 191.4F Memo DRF: cm(35-191.4), 30 Aug 79

2. Private Communication, G. Mershimer, SESEF/CSER Code 191.44, 29 Dec 1981.

1. The following radio frequencies are assigned for Shipboard Electronic Systems Testing and Certification, Antenna Radiation Patterns, EMIS, and the Coordination of Sea Trials.

Antenna Radiation Patterns ARP
Primary Listing (HF)

CRKT Desig	Frequency (kHz)	Emission	Power Output (W)
HF 1	452	Note 2	500
3	2576	1	500
7	3268	1	500
11	4040	3	500
16	5335	1	500
20	6970	1	500
21	7500	1	500
26	8190	1	500
28	9380	1	500
29	12045	1	500
31	13380	1	500
32	15525	1	500
33	17540	1	500
34	18990	1	500
35	20675	1	500
36	23000	1	500
37	25225	1	500
38	26775	1	500

2. Alternate ARP/Primary EMIS (HF)

CKT Desig	Frequency (kHz)	Emission	Power Output (W)
HF 2	TBA	Note 5	
5	2844	1	500
7	3191	4	500
8	3357	3	1000
17	5785	4	1000
22	7645	1	500
24	7965	1	500
27	9095	1	500
30	12145	1	500

Note:

#1. Emission is: 0.1.A1, 1.24F1, 2.8A3J, 3A7J, 6A3B, 6A9B

#2. Emission is: 0.1A1

#3. Emission is: 0.1A1, 1.24F1, 2.8A3J, 3A7J, 6A3B, 6A9B

#4. Emission is: 0.1A1, 1.24F1, 2.8A3J, 3A7J

#5. Frequency will be assigned at a later date.

3. HF voice coordinating

CKT Desig	Frequency (kHz)		Emission	Power Output (W)
HF 4	2656.4	(2655)	2.8A3J	1 kW
10	4011.4	(4010)	2.8A3J	1 kW
13	4514.4	(4513)	2.8A3J	1 kW
15	4976.4	(4975)	2.8A3J	1 kW
19	6836.4	(6835)	2.8A3J	1 kW
23	7963.4	(7962)	2.8A3J	1 kW

4. Voice primary hf for SESEF will be:

7963.4 (7962) 2.8A3J

5. Voice coord freq for NTDS will be (when operating dockside/sea trial with special unit)

4976.4 (4975) kHz
3358.4 (3357) kHz
5786.4 (5785) kHz

6. There will be no communication systems testing on any other frequency or emission not authorized. In addition, 6A3(AM)modulation testing of any HF transmitters is no longer authorized per OPNAVINST. 2400.23.

7. VHF Freq Assignments

Note	CKT Desig	Frequency (MHz)	Emission	Power Output (W)
1	V 1	36.9	6A3/36F3	50
2	2	47.7	6A3/36F3	50
1	3	53.9	6A3/36F3	40
1	4	72.92	6A3/36F3	40
1	5	133.74	6A3	30
2	6	138.78	6A3	30
2.3	7	140.80	6A3	30

Note:

1. ARP primary test freq
2. ARP alternate test freq
3. Code 190 walki-talki test freq

8. UHF Frequencies

Note	CKT Desig	Frequency (MHz)	Emission	Power Output (W)
2	U 1	250.9	6A3	180
5	2	251.4	6A3	200
4	3	273.0	6A3/37.5A9/45F9/0.3F1	200
3	4	277.1	6A3/37.5A9/45F9/0.3F1	200
7	5	277.9	6A3/37.5A9/45F9/0.3F1	200
4	6	283.4	6A3/37.5A9/45F9/0.3F1	200
2	7	300.5	6A3	180
7	8	312.7	6A3/37.5A9/45F9/0.3F1	200
3	9	313.8	6A3/37.5A9/45F9/0.3F1	200
5	10	321.8	6A3	200
4	11	336.2	6A3/37.5A9/45F9/0.3F1	200
1	12	340.4	6A3/37.5A9/45F9/0.3F1	200
5	13	361.8	6A3	200
6	14	385.0	6A3/37.5A9/45F9/0.3F1	200
4	15	387.4	6A3/37.5A9/45F9/0.3F1	200

Note:

1. UHF Secondary SESEF Comm
2. SATCOM Test
3. Code 967 Test
4. ARP Freq Primary (Test)
5. EW DF URD-4
6. UHF Primary Comm
7. Special Test
8. Alternate ARP Test

9. Any of the above frequencies which have been identified for "ARP" test may be used for systems test, ie, dockside or POT&I either in San Diego or Long Beach Area.

10. Other test frequencies for noncommunications frequencies include:

200 225 MHz

400-450 MHz

850-950 MHz

1000-1100 MHz

1250-1400 MHz

2900-3100 MHz

3400-3600 MHz

5450-5825 MHz

8500-8600 MHz

11500-12500 MHz

INITIAL DISTRIBUTION

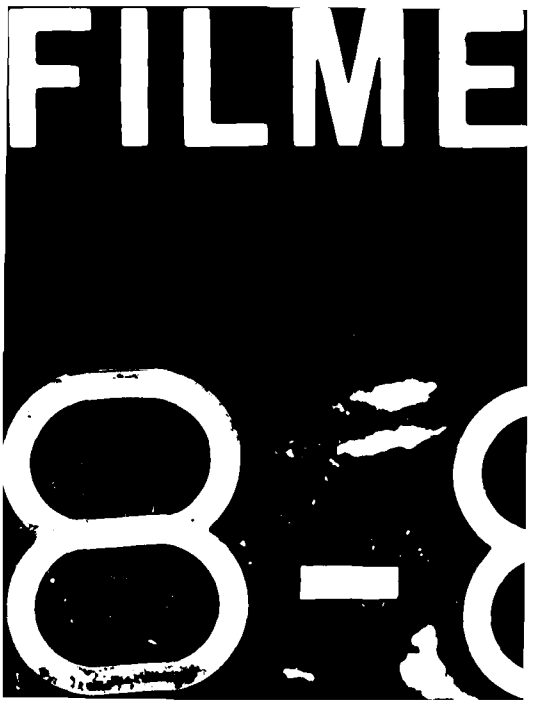
NAVAL SEA SYSTEMS COMMAND
- SEA 0141
- SEA 06C21
- SEA 06F
- SEA 61X3
- SEA 61X32

NAVAL ELECTRONIC SYSTEMS COMMAND
- NELEX 614

LONG BEACH NAVAL SHIPYARD
- Code 191.44 (Mr Malakoff)

NAVAL POSTGRADUATE SCHOOL
- R ADLER

DEFENSE TECHNICAL INFORMATION CENTER


FILME
8-8